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Study of General Aviation Fire Accidents (1974-1983)

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16. Abstract

This report describes a study of fires and interior materials in General Aviation (GA) aircraft during 1974-1983. The purpose of the study was to learn trends in GA fires and the materials used in aircraft interiors. The study covered aircraft of less than 12,501 pounds gross weight, not in commercial or agricultural operations.

Fires are a minor part of GA accident experience. Accident data yielded 2,351 post impact fires having 798 fatalities. These accidents were 6 percent of the total of 36,130 GA accidents. Only 153 inflight fires occurred during the period from 1974-1983. The GA fire population closely resembled the entire GA aircraft population. One difference was that fatalities and aircraft damage increased with higher approach speeds and gross weights up to 10,500 pounds. Also, the proportion of fire accidents and fatalities was greater in low than in the more common high wing aircraft. For inflight fires, the aircraft engine was the major fire origin for twin- and single-engine aircraft. Only in single-engine aircraft was the instrument panel a source of inflight fires.

Data on the 20 most common GA aircraft disclosed conventional materials, similar to those used in the home. Polyurethane foam cushioning, wool and nylon fabrics, ABS plastic and aluminum typify the materials used in these aircraft.

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PREFACE

This report was prepared by EVENTS ANALYSIS, Inc. under Contract No. DTFA 03-85-C-00018 with the Federal Aviation Administration (FAA) Technical Center, where Gerald R. Slusher acted as Technical Monitor.

The EVENTS ANALYSIS, Inc. Program Manager has been Richard W. Clarke, with subcontract assistance by the AOPA Air Safety Foundation and by Veda Incorporated. The AOPA Air Safety Foundation's subcontract manager has been Russell S. Lawton; Veda Incorporated's subcontract manager has been Albert L. Raithel. The National Transportation Safety Board's Accident Data Division has been of invaluable assistance in compiling information used during this study.

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EXECUTIVE SUMMARY

This study describes patterns of General Aviation post-impact and inflight fire accidents and documents the application of the various interior materials used in common General Aviation aircraft. The study focused on the period 1974-1983, since this was the most recent ten-year period for which complete fire mishap data were available from the National Transportation Safety Board and the Federal Aviation Administration.

In general, the fire accident was rare among General Aviation aircraft during the study period. During the period 1974-1983, 6.5 percent of the total General Aviation accidents involved fire, and, of the total General Aviation fires, only 6 percent occurred inflight. The character of the fire population studied mirrored that of the total General Aviation aircraft population, though there was some indication that low winged aircraft accidents had more serious outcomes in fire related accidents than did other airframe configurations.

The materials used in construction of the twenty most common General Aviation aircraft are of conventional nature. The fabrics and structural materials are like those used in furniture and are not like the more specialized materials found in transport aircraft. Wool, nylon, leather, polyurethane foam and ABS plastic typify the class of materials used in these aircraft during the period 1974-1983. Use of materials other than conventional natural and manmade fibers has occurred only in recent years.

INTRODUCTION

PURPOSE. The purpose of this study was to achieve an understanding of the basic characteristics of General Aviation aircraft fires and to document the materials commonly used to furnish and construct General Aviation aircraft interiors. Additionally, trends in General Aviation fire characteristics and application of interior materials were to be described.

BACKGROUND. The General Aviation community comprises the largest, most active and most varied segment of United States aviation. In recent years, attention to aircraft fire safety has focused on transport category aircraft. Other aircraft operations, such as General Aviation, have not been studied as thoroughly as transport aircraft, so less is known about the scope and nature of fires among General Aviation aircraft. Seeking to determine the peculiar fire safety needs of the General Aviation community, the FAA initiated this study in 1985 for the purpose of learning the patterns characteristic of fires among General Aviation aircraft.

Since much work has been done in the area of transport aircraft interior materials, there exists a body of data on the fire safety characteristics of these materials to which other material listings can be compared. For General Aviation there was no overall picture of the interior materials in use. Before any comparisons could be made to existing information, it was necessary to determine the types and quantities of materials used in General Aviation aircraft interiors. This research was incorporated as a second element of the study.

General Aviation operations are so diverse, it was necessary to decide which part(s) of General Aviation would be researched. The feeling of the researchers was that the most typical part of General Aviation was that not involved in any commercial application. For this reason the population of aircraft to be studied was set as aircraft less than 12,501 pounds gross weight, not involved in agricultural operations and not used in commuter airline service. With this population selected, the program to portray the characteristics of General Aviation fires was started.

STATISTICAL ANALYSIS OF INFLIGHT AND POSTCRASH FIRES

PURPOSE

One of the two objectives of the General Aviation Fire Study was to portray basic characteristics of the fires in the General Aviation aircraft population. In accordance with the Statement of Work, data concerning the aircraft and fire accident attributes was acquired to describe General Aviation fire accident experience during the period 1974-1983. The population studied was aircraft of less than 12,501 pounds gross weight, not involved in agricultural or commuter airline operations.

DATA SOURCES

The data sources used for the study were:

- National Transportation Safety Board (NTSB) accident/incident records,
- Federal Aviation Administration (FAA) accident/incident records, and
- publications describing aircraft configurations and performance.

NATIONAL TRANSPORTATION SAFETY BOARD (NTSB).

The principal source of accident information used in the study was the computerized accident data system of the NTSB, supplemented by case files of selected accidents. At the time the study began (June 1985), the NTSB computer files were complete through 1983. Incomplete 1984 data were available, but it was decided not to use that data, since the 1984 information would be continually changed as the NTSB finalized these records. Based upon availability of information, the ten-year period for this study was established as 1974-1983.

NTSB Computer Record Characteristics. For the period 1974-1983, the NTSB accident/incident records are stored in three separate data bases. The three data bases superficially are alike, but there are significant differences that directly influenced the conduct of the study and the findings.

- 1974-1981 - During this period, the NTSB computerized accident/incident data base record structure remained constant. For the most part, the entries relating to fire involvement were codes selected from among a limited number of choices available to field investigators. This is an early form of data base that is relatively simple in structure and lacking in detail.

- 1982 - In this year, the NTSB investigation program was in a period of transition toward improved data collection and description. For this one year, an improved, interim, data format was used that substantially expanded the number of codes available for recording mishap information. In most cases, the coding choices were much different from those of the earlier system.

- 1983 - The 1983 format for data collection was an improvement of the 1982 interim data collection program and has been accepted as the standard format since implementation. The coding choices were different for this system than for either of the two predecessors.

NTSB Data Base File Structures. Information about the 1974-81 data base was readily available in an NTSB coding guide. This data base contained a number of spaces or data "fields" for both inflight and post-impact fires; however, many fields in each accident record were blank.

Information about the 1982 transition data base was scarce, since that data base had not remained in use long enough to be well documented. Information showing the fields in the data base ultimately was drawn from a completed accident investigation reporting form, located in an NTSB accident file in the NTSB archives. In that 1982 form, for field investigators, fires were reported on a special section of the form separate from those sections recording make and model, casualties and other data.

Information about the 1983 data base file structure was provided by the NTSB staff. The 1983 format was similar to the 1982 format, but there were differences in the data code choices available to investigators.

Access to NTSB Computerized Data Bases. The NTSB computerized data bases were accessed by requesting specific data outputs from the NTSB's Accident Data Division. The NTSB staff was cooperative in identifying the file contents and providing advice about the contents of the fields, as well as providing printouts. However, the data could only be reviewed after printouts were obtained, so the process of obtaining this information was slow and cumbersome.

ACCIDENT CASE FILES. The NTSB maintains case files for each accident investigated by its staff. These case files also were compiled through 1983; however, the files for years prior to 1978 had been destroyed, due to storage limitations. Case files, in microfiche form, for years 1979-1983 were available for review and were used in the study of inflight fires.

FEDERAL AVIATION ADMINISTRATION (FAA).

The FAA maintains an Accident/Incident Data Base (AIDS) that can be directly accessed by computer link. Since the AIDS data base structure contained fire data items, it was thought that AIDS might supplement NTSB data. Of particular interest were fields indicating inflight and on-ground fires, as well as a field indicating fire as an "other" factor in an accident/incident.

OTHER DATA SOURCES.

As the NTSB and FAA accident data base entries became available, it was apparent that the information about aircraft fuels, weights, exits, approach speeds, inflight fire origins and make/model descriptions was not consistent among the data bases. Numerous incorrect entries were found. Further, much of the information was either omitted or not required to be recorded. For this reason, other data sources had to be found to obtain information on those attributes.

AIRCRAFT CONFIGURATIONS. In developing the lists of aircraft on which data was to be gathered, the Make/Model designations in the NTSB fire data printouts served as the basis for subsequent refinement. After removing incorrect entries such as transport category aircraft and correcting coding errors, a list remained which was suitable as the basic study population. For this list of aircraft, the following information had to be acquired, where available: wing/airfoil configuration, fuel type, approach speed, gross weight, and number/size of emergency exits.

The General Aviation aircraft population is large and diverse with several hundred different aircraft types making up the overall population of 200,000 odd aircraft. Many of these have been out of production for years. For this reason, the search for this information proved challenging and required use of several different types of data sources. Manufacturer product information was useful on newer aircraft, however, the detail in this source was not consistent. Standard aircraft reference books, such as Jane's All the World's Aircraft and the Aircraft Blue Book provided certain information, as did aircraft comparison tables published by aviation periodicals. This was augmented by personal knowledge of the investigators concerning some aircraft models.

AIRCRAFT POPULATIONS. The population of General Aviation aircraft involved in fires was defined by the accident data base, however, for certain parts of the analysis it was necessary to compare the numbers of aircraft involved in fires with the total number of aircraft of the various makes and the total, overall. To determine these numbers, the investigators used the information published in the 1974-1983 annual editions of the FAA's Census of U.S. Civil Aircraft. This publication provided totals for the overall population of General Aviation aircraft, as well as counts of aircraft by aircraft make/model designations. The Census data did not correspond, exactly, with the make/models derived from the accident data base; however, the make/model designations were close enough to permit some analysis to be done.

PREVIOUS FIRE RESEARCH. Other data sources explored were previous fire research reports involving General Aviation aircraft accidents. The first report reviewed was the 1980 NTSB Special Study - General Aviation Accidents: Postcrash Fires and How to Prevent or Control Them (NTSB-AAS-80-2). This study had linked preliminary numerical analysis to text describing various fire safety design techniques and regulatory matters. Due to the lack of detail in the report, its only use was as a general description of the problem.

The second report reviewed was a study done by Robertson Research, Inc., in 1980 (Systems Analysis of the Installation, Mounting and Activation of Emergency Locator Transmitters in General Aviation Aircraft). This report was known to cover aircraft damage in 1,135 United States and Canadian General Aviation aircraft accidents. The focus of this study was action that might improve Emergency Locator Transmitters installation techniques and activation mechanisms. Fire data were contained in the study, but it was oriented toward effects rather than origin of fires, and covered only one year of United States data. For these reasons, this study was not germane and was not included as an information source.

A third report reviewed was the contemporary fire safety report being drafted by the aviation industry's General Aviation Safety Panel (GASP). The GASP fire safety research was in progress and was an outgrowth of earlier work in crashworthiness. This study was being approached in a different manner from that of the FAA study; in the GASP study, a limited number of recent case files were being analyzed for detailed information on fire patterns, impact dynamics, injuries, etc. Descriptive information not available in the NTSB computer records was used for the GASP study, thus it was a detailed review of a small sample of General Aviation fires, as opposed to the ten-year trend analysis approach of this FAA study. The two independent studies appear complementary. No direct use could be made of the GASP work, since the GASP study was also in the research stage.

DATA SEARCH APPROACHES AND METHODS

NTSB DATA SEARCHES.

The initial screening of the NTSB data was to examine the file structures for each of the three computerized data bases, and to locate data describing the variables specified in the Statement of Work. Since the data bases could not be accessed in "real time" from a terminal, a serial procedure to acquire data was used.

ACCIDENT BRIEFS. The first step was to acquire a set of recent accident briefs, to review and screen possible data fields of value while acquiring information about the data base structures. One advantage of the briefs was the narrative text which permitted more analysis of the fire events than did the coded data. Additionally, the briefs were available without delay, permitting some research to begin during delays in obtaining information from the NTSB and gaining access to the FAA data base.

To facilitate the collection and analysis of the variables needed for the study, an inhouse data base was designed to record the information obtained from the NTSB and FAA. The first inhouse data base was used to collect the data from the accident briefs for the years 1982 and 1983. This enabled the study team to begin screening and judging the adequacy of this data for the study.

1974-1981 RECORDS. After reviewing initial printouts from the NTSB, additional information was requested. This additional information was for inflight and "post-impact" fires. The information requested was:

- the accident case identification number (to permit later retrieval of the accident case file from the archives)
- the make and model of the aircraft
- the accident data
- other fire-related information that might be available.

Data Conversion. The NTSB printouts were difficult to work with so, they were converted to computer data base files that could be analyzed on inhouse computer systems. Optical scanning methods were used to move the data from printout to disk format. The data set for each year was verified for accuracy of the scanner entries, analyzed for duplications and omissions, and quality thoroughly checked. The scanner error rate was extremely low; only 20 scanner errors were found in over 2500 records containing at least 22 fields per record.

As further data from the NTSB became available, a new data base was used to accommodate and consolidate the new data with the data from other sources. That same general format was then used with the FAA AIDS data base.

1982-1983 RECORDS. The structure of the 1982 and 1983 data bases was compared to that of the 1974-1981 NTSB records to identify data that might be compatible. Because the 1982 and 1983 data bases were structured differently from the 1974-1981 data base (and from each other) most of the emphasis was on the 1982 and 1983 Supplemental form for fires, and the aircraft make and model attributes that seemed to be available. These data were requested, together with the ID numbers of the accidents, so that the data could be cross-checked with the data from the briefs.

Upon receipt of the these printouts, it was found that the ID numbers of each record did not correspond to the ID numbers on the briefs. To permit the two files to be reconciled, it was necessary to request another data run, showing both sets of ID numbers and the accident dates.

FILE REVIEWS. For the 1974-1981 data, entries in the requested fields on the printout were scanned for completeness and consistency. The process of reviewing the 1982 and 1983 data was more complicated than it had been for the 1974-81 data. The file searches from NTSB for the 1982 and 1983 years were provided by Supplement Number, rather than consolidated into lists containing the information of all the Supplements, as had been possible with the 1974-1981 data base. Therefore, the individual printouts had to be recombined to relate the fire data to the aircraft make and model. While running error checking routines, anomolies were discovered between the briefs and the other data printouts being received, especially in the fire data fields and aircraft groups selected for the printouts. The data contained coding of inflight fires as post-impact fires and vice versa, included some makes and models in excess of the 12,500 pound gross weight, and also included balloons. These discrepancies were corrected where the information required to make a decision was available.

INFLIGHT FIRE INFORMATION. Since the number of General Aviation inflight fires was relatively small, inflight fires could be studied by reference to the case files in the NTSB archives. These files were searched to determine if the narrative description of the accident pinpointed the fire origin and to verify the fire origin codes shown in the NTSB printouts. At this time it was learned that the 1974-1977 files had been discarded, and that the 1978-1981 records were on microfiche.

The microfiche reports were often handwritten and were, at best, very difficult to read. On most fiches, the photographs were unintelligible for the purposes of this study. The consequences of these problems for the study are discussed later in the text.

FAA AIDS SEARCHES.

The FAA data bases comprising the AIDS system were searched using a remote terminal under access arrangements made by the FAA's project Technical Representative. The FAA files were read into individual computer files and assembled into data bases for subsequent analysis.

OTHER DATA SEARCHES.

In order to compare incidence of fire accidents with the variety of aircraft attributes or characteristics stipulated in the Statement of Work, research was required to amass data sufficient for analysis. Initial use of NTSB and FAA accident data base records revealed that the information entered for each aircraft make/model was very often incomplete or incorrect. For this reason, each of the attributes had to be determined or verified from other sources.

WING CONFIGURATION AND FUEL TYPE. Except in the case of rare or certain antique aircraft, the wing configuration and fuel type was verified by the project investigators. Where personal knowledge was not sufficient, standard aircraft references were used. Only in the case of "home-built" aircraft was there significant difficulty in learning wing configuration and fuel type. For home-built aircraft, the fuel type was generally aviation gas.

GROSS WEIGHT. Aircraft gross weight obtained from manufacturer literature, the aircraft FAA Type Certificate Data Sheets and standard references, usually differed from NTSB data. For this reason, the data obtained by the project investigators was utilized, since it was from known sources and not subject to coding errors.

APPROACH SPEED. This information was not available in the accident data bases. Though approach speeds were sometimes given by manufacturers, usually there were none specified. To provide a standard for comparison of approach speed among the widely differing types of General Aviation aircraft, the investigators adopted 1.3 times the aircraft's stall speed, in knots. Where the stall speed information for older aircraft was listed in statute miles per hour, the speed was converted to nautical miles per hour. Even though aircraft weights may have varied at the time of the mishap, some basis for comparison was required. 1.3 V_s is based upon the commonly available value of stall speed at maximum gross weight which must be demonstrated and recorded for each type of aircraft. While this speed is not necessarily the speed of the aircraft at the time of an accident, 1.3 V_s provides a generally accurate indication of approach speed for aircraft.

EXIT TYPES AND SIZES. It became apparent, early in the study, that the variety of aircraft manufacturers, aircraft production dates and aircraft types found in General Aviation meant that aircraft exit information was not documented in any standard manner. For the most part, door sizes could be found for production aircraft, but emergency exit sizes were usually not recorded. Configuration of the aircraft exits was often not given in any texts or else the texts were in disagreement. Among home-built aircraft, exit information was almost totally lacking. Wherever available, exit information was recorded, but this part of the project data base could only be partially filled with size and location information. For size of the exits, diagonal measurement of the exit was used as the study's standard, since it provided a single measurement indicative of the useful size of the exit.

AIRCRAFT POPULATIONS. To compare the aircraft involved in fire accidents, it was necessary to first count the number of aircraft of each type in the fire data base. Then counts were made, in the FAA's Census of Civil Aircraft, of the yearly population of each make/model that had shown up in the fire data base. While older, out of production, aircraft had a stable or gradually decreasing population during the ten-year study period, the totals for newer aircraft steadily increased. The approach used in the study for determining the population of the make/models was to take an average of their numbers during the period. For older aircraft, the resulting number was a ten year average, while for newer aircraft, the number was an average only for the number of years that the aircraft were counted.

DATA RECONCILIATION, CONSOLIDATION AND PRESENTATION

After the data were captured in the data bases created for the study, the entries were reconciled, consolidated and prepared for analysis and presentation.

NTSB DATA.

1974-1981 DATA. The reconciliation of this data involved screening for aircraft not meeting the study parameters because of their size (e.g., over 12,500 pounds), operations (e.g., agricultural) or nature (e.g., balloons); and verifying that the record totals were consistent with the totals reported by NTSB. Only 36 of 2696 records had data about impact speeds; these 36 cases involved 19 fatalities. This did not provide a sufficient sample of this variable to justify further analysis.

1982-1983 DATA. The major data reconciliation effort arose while verifying whether or not the records belonged in the inflight fire or post-impact fire category. For example, on the investigators' fire data supplement of the 1983 accident report form, the information columns needed to be screened for consistency. Several accidents had to be shifted from the inflight to the post-impact fire categories during this check, or removed altogether because they did not involve fires of the types desired for the study (e.g., one accident involved a collision with a ground vehicle, with no fire). Other problems included aircraft of over 12,500 pounds gross weight, and balloons mixed into the records. Of 199 accidents on the 1983 NTSB printout, for example, after balloons, oversize, and other disqualifying records were removed, only 106 records remained for study.

In an effort to acquire additional 1982 and 1983 information, the NTSB was asked to provide data printouts. The second NTSB information run produced more accident records than the first run. When the runs were checked against each other, it was found that two different case identification numbers were used on these two runs. To enable reconciliation of the data in the printouts, a third run with both ID numbers and accident dates was requested, so that the records could be cross-checked. This run and a subsequent quality control check disclosed yet another discrepancy; one of the cases which appeared on the complete second run did not appear on the third run, and an extra case appeared on the third run. Since the detailed data from the second run indicated the extra record on the second run was probably valid, it was retained in the records. Since the extra record on the third run could not be verified, it was dropped.

1983 Ground Fire Records. This file contained 204 records of ground fires, 107 of which indicated the fire or explosion occurred after impact. It should be noted that some of the 204 accident records contained entries describing additional locations of fires on the fire information supplement of the investigators' accident report forms. Twenty-one of the 107 records had a second entry and seven records had a third entry under location, but all were in addition to the post-impact entries for the first locations.

One of the printouts provided was a set of accident briefs for the year 1983. The intent was to gain access to the narrative description of the accidents as well as the causal factors relative to this study. However, it was found that the screening of the general aviation accidents was less than satisfactory, and the briefs were not useable as intended.

CONSOLIDATED DATA. A total of 2,629 post-impact fire records were listed on the NTSB printouts. In these records, a total of 845 different makes and models of aircraft were listed. To utilize the records for the study, they had to be verified and the make/model information had to be consolidated into groups with essentially similar characteristics. Of the 2,629 total post-impact fire accidents reported on NTSB printouts, only 2,351 were usable for this study. The remainder were screened out during reconciliation and quality control checks. Most of the records removed from the data base were from the 1982 and 1983 files.

In summary, the analyses of 1974-1983 General Aviation fire related accidents focused on 233 aircraft models, involved in 2,351 post-impact fire accidents. Of the 2,351 accidents, 374 involved fatalities; the total of those fatalities was 798. An aggregated count of these accidents is shown in appendix A by aircraft make/model.

FAA DATA.

The FAA data search involved AIDS data bases for the years 1971-1979 and 1980-present. The structure of the data bases overlapped some of the NTSB data base structure, but in the fire accident area, it was sufficiently different that it could not be integrated directly into the NTSB data. The primary difference was in the way the accidents involving fires were categorized. The AIDS data base provided only three primary indications of fires:

- a "fire or explosion in flight " type accident or incident category,
- a "fire or explosion on ground" type accident or incident category,
- fire (inflight/ground fire) as an "other factor" category.

AIDS records were searched for NTSB case ID numbers for all inflight or ground fires to identify specific new data not previously found in NTSB files. One hundred nineteen (119) inflight and 51 on ground or 170 total fire records for accidents involving aircraft in the study group were found. All records with an NTSB case ID number were coded by the year in which they occurred so they could be grouped for search and comparison convenience. Analysis of the remarks accompanying the above entries disclosed that the coding scheme used to differentiate between the inflight and post-impact fires in the FAA AIDS data base seemed different from that used by the NTSB in its records. Thus, the data could not be combined with confidence into the inflight and post-impact data categories used for the NTSB files.

The AIDS data base was searched for records containing fire codes in the "other" field to find useful data that was not found in the inflight and ground fire searches. This search turned up 78 records. Those records were for accidents and incidents occurring during 1978 and 1979 only; data for earlier years was apparently not recorded. Another data base review to differentiate between accident and incidents disclosed only one accident on the above list: a 1979 accident with severe damage to the aircraft. All the rest of the information was from incidents. In summary, this "other" search yielded only one accident that was not reported in the NTSB data base. Therefore, further analysis of the "other factors" records was not attempted.

<u>OTHER DATA</u>.

In preparation for final analyses, it was necessary to gather several other types of information besides that gained from the NTSB and FAA. Make/model groupings had to be established as did knowledge of the various performance and configuration attributes of the make/model groups.

<u>MAKE/MODEL GROUPS</u>. The diversity of General Aviation aircraft models and manufacturers presented some difficulty in establishing the group of aircraft to be researched. The initial group of aircraft was that gained from the NTSB list of General Aviation aircraft involved in fires during 1974-1983. This list was essentially "raw data" needing refinement. For reasons of many different investigators providing the data, many other people entering the coded data into the data system, and confusing similarity or obscurity of many aircraft models, a screened and consolidated list needed to be developed. Researchers first reviewed the list of aircraft and removed types which were outside the study parameters for weight, type or commercial operation. Next, the list was modified to group aircraft under practical descriptions. In the case of the Aero Commander, Aerostar, Bellanca Champion and several other series of aircraft, more than one manufacturer had produced those aircraft during their production life. For this reason, those aircraft were described in the consolidated data base by "generic" descriptions which would be readily pictured by those familiar with General Aviation aircraft. For these, the aircraft may have had one manufacturer or another, but its "make" was described as the commonly understood name (e.g., Aero Commander, Aerostar, etc.).

While some manufacturers labeled their various makes of aircraft in regular sequenced number or letter series that remained constant throughout variations in the basic type, others changed labels in ways that lead to confusion over which aircraft were being described. In other cases, manufacturers made substantial changes to aircraft that affected speeds, capacity, exit patterns and even powerplant type, yet the listing continued to be under the original type certificate designation (e.g., the PA-23 series of Apaches and Aztecs). In effect, the aircraft recognized by the public through use, contact or marketing efforts were often unrecognizable in the NTSB and FAA accident data bases and in the Census of Civil Registered Aircraft.

The 1982 and 1983 NTSB data formats were much more specific as to make/model than the 1974-1981 system. In the earlier system, no matter what type of aircraft (e.g., PA-28 Cherokee series) was involved, the aircraft was shown under one description. The PA-28 series varied widely in characteristics such as speed and one was a retractable gear aircraft, yet the early NTSB system did not discriminate between models.

<u>AIRCRAFT POPULATIONS</u>. The lack or detail in aircraft make/model descriptions was repeated in the FAA's annual aircraft census data. Here, one system was used through 1979 with an improved, interim system implemented in 1980 and another refinement adopted from 1981 onward. The data problems were very similar to those found in the NTSB system of descriptions. The earlier FAA system did not adequately discriminate among aircraft models, so several aircraft found in the NTSB data that should have been treated separately, due to configuration, had to be grouped with other aircraft bearing a single model number. After 1979, the FAA's census system permitted much better discrimination of aircraft models.

Each of the three FAA census systems had one common problem, however. Researchers, in establishing the total populations of the various aircraft, had great difficulty in consolidating the totals of aircraft when several manufacturers produced the same machine. As an example, the Aero Commander series was produced by North American, Rockwell, and Gulfstream American. Some few aircraft (mostly antique or home-built aircraft) were not identifiable in FAA listings or industry references since they were of such small numbers or obscure designations that no good description existed. Home-built aircraft were often listed by the NTSB under the builder's surname while aircraft such as the Stearman biplane were produced under so many civil and military designations as to make tallies impractical. In the case of the obscure aircraft, these problems were time consuming but did not impact the study greatly because they were a small proportion of the 200,000 odd General Aviation aircraft. More significant was the problem in data reliability presented by being unable to discriminate among the various models of PA-28 series aircraft (one of the most common of General Aviation aircraft).

Appendix A lists the final grouping of makes/models used for the study. To the greatest extent possible, these make/model groups represent commonly understood aircraft descriptions. Where, within a model group, changes were made that altered the fuel type, these models are listed distinct from the others. In all cases, the variability of the consistency and quantity of the data make it possible to be only approximate in describing fire trends among General Aviation aircraft.

COMMENTS ON THE DATA ACQUISITION PROCESS

Several experiences with the acquisition and processing of the accident data merit comment.

<u>DATA ACCESSIBILITY</u>.

Electronic accessibility to the NTSB data base is provided only to agency employees. Copies of the entire data base are available (on tape) to outsiders, and at least one private firm offers data runs from such a copy. The agency does not provide access to its data base from outside computer terminals; however, the NTSB did provide all data requested of it in the form of printouts within 10 days to 4 weeks of the request. This arrangement precludes looking at the NTSB data base fields to make preliminary assessments of their content and utility before making file search and retrieval decisions. The practical results of this restriction are substantial delays (about 4 months from first request to last printout), extra data searches, printouts and handling, and the unnecessary expense of duplicating the data for subsequent computer processing, analyses and evaluation of over 2500 records.

As in other "mainframe" oriented safety data systems, any searches or outputs other than commonly used preformatted reports are difficult to carry out despite the willing cooperation of the data system staff. Obtaining such data requires either adding workload to personnel who are already fully committed or obtaining the data in a tape format suitable only for mainframe data systems and at an expense not justifiable for one time application.

In comparison, the FAA Accident/Incident Data Base (AIDS) was made directly accessible for preliminary searches and data transfer. This accessibility permitted scanning and assessment of the contents of the data base in just a few sessions. In this way, for example, data fields that contained irrelevant or ambiguously classified data, or which were substantially incomplete were readily identified and avoided. After the initial screening, the downloading of appropriate and useful data permitted analyses and cross-checks to be made quickly and efficiently. Even though the AIDS information ultimately was found to be duplicative of the NTSB data, AIDS data acquisition was completed within three weeks after the administrative and technical arrangements were completed.

DATA QUALITY. The NTSB data base structure contains many fields that are used to record information about individual accidents. However, fields of interest in this study, such as the gross weight of the aircraft, approach speeds, and impact speeds, were not available for all accidents. The practical result of this lack of information was that there was not an adequate basis for statistical analysis of the data. The partial data had to be abandoned or acquired from other sources.

Coding errors discerned in the 1982 and 1983 data were significant. For example, 4 of 14 accidents were miscoded in the 1983 inflight fire category and were dropped from study - an error rate of over 25 percent. These discrepancies were discovered when narrative files were reviewed and compared against the coded entries in the computerized data base. The error rate for the 1978-1981 entries was much lower. The error rate prior to 1978 could not be checked because the narrative files had been discarded.

The FAA data base codings posed a slightly different difficulty. The nature of the coding categories required judgment calls to be made in numerous accidents. For example, some entries indicated that the crash occurred during the commission of a crime, yet they were coded as accidents. This difficulty was readily discernible when the remarks sections of the data base were compared with the entries in related fields.

DATA SUMMARIES

INFLIGHT FIRE ACCIDENTS.

As previously described, the small size of the population of inflight fires permitted a detailed analysis of the mishap information. Since pre-1979 case files were not available from the NTSB, the population of inflight fires for the years 1979-1983 was reviewed. Several accidents were discarded as being incorrectly coded inflight fires, so that the final study group was a population of 70 accidents over the five-year period.

Looking at the types of fire sources and fire locations that occurred in the 70 accidents, the distribution characterizes the fire problems in the inflight fire population. Dividing the accident population into single- and twin-engine aircraft, as illustrated in tables 1 and 2, drawn from appendices B and C, shows interesting similarities and differences.

SINGLE ENGINE AIRCRAFT. Forty (57 percent) of the 70 inflight fires occurred among single-engine aircraft. Of these forty, 21 (52 percent) were destroyed. The dominant factor in these fires is the engine compartment which was the fire location in 22 of the 40 accidents. Engine components, fuel lines, oil leaks and electrical shorts all occur in this location to a far greater degree than any other location. Next, or second, in degree of involvement are instrument panels; seven fires occurred in instrument panels with six confirmed as electrical in origin. Cabin fires were next most common with six instances. These fires were less well defined, but included one instance when a passenger fired a flare gun; this lead to two injuries and the eventual loss of the aircraft. Unknown or unspecified fire origins (2) were next in order of importance followed by equal numbers of involvement (1) for fuselage, baggage compartment, and battery compartments.

TABLE 1. LOCATION AND ORIGIN OF INFLIGHT FIRES
AMONG SINGLE-ENGINE GENERAL AVIATION AIRCRAFT (1979-1983)

LOCATION¶ OF FIRE¶	ORIGIN OF ONBOARD FIRE: Electrical System	Fuel System	Heater	Passenger	Powerplant & Components	Unknown	
Instrument Panel	6	0	0	0	0	1	
Engine	3	2	0	0	10	7	
Baggage Compartment	1	0	0	0	0	0	
Battery	1	0	0	0	0	0	
Cabin	1	1	0	1	0	3	
Fuselage	0	0	0	0	1	0	
Unknown	0	0	0	0	0	2	
Subtotal	12	3	0	1	11	13	-- 40

TABLE 2. LOCATION AND ORIGIN OF INFLIGHT FIRES
AMONG TWIN-ENGINE GENERAL AVIATION AIRCRAFT (1979-1983)

LOCATION OF FIRE	ORIGIN OF ONBOARD FIRE Electrical System	Fuel System	Heater	Passenger	Powerplant & Components	Unknown	
Instrument Panel	0	0	0	0	0	0	
Engine	1	5	0	0	14	3	
Rear Baggage Compartment	1	0	0	0	0	0	
Battery	0	0	0	0	0	0	
Cabin	2	0	0	0	0	0	
Fuselage	0	0	0	0	0	0	
Wing	1	0	1	0	0	0	
Wheel Well	0	0	0	0	1	0	
Unknown	0	0	0	0	0	1	
Subtotal	5	5	1	0	15	4	-- 30
TOTAL for Single- & Twin-Engine Aircraft	17	8	1	1	26	17	-- 70

<u>TWIN ENGINE AIRCRAFT</u>. All the remaining 30 (43 percent) of the inflight fires occurred among twin-engine aircraft with 12 (40 percent) of the 30 being destroyed. The distribution of these fires among twins was more simple with the powerplant area being an even clearer problem among twins than among singles. Twenty three (77 percent) of these fires originated in the engine compartments with exhaust failures and oil leaks being the chief problems. The second and third most common locations were the cabin and wings, each with two instances; electrical shorts were the main problem in these areas. Fourth, fifth and sixth ranked were rear baggage compartments, wheel wells and "unknown" sources, each with one instance. Clearly, the most important failure area was the engine compartment.

<u>INJURY PROFILE</u>. Viewing the problem of inflight fires from the aspect of injuries and fatalities illustrates other points about this fire group. Thirty-eight (54 percent) involved no fatalities or injuries, though in 11 of the 38 cases, the aircraft was destroyed. Inflight fire accidents with injuries but no fatalities (15 accidents or 21 percent) ranked nearly evenly with those having fatalities but no injuries (14 accidents or 20 percent). In each of these two cases, ten aircraft were destroyed. In only three of 70

cases were there both fatalities and injuries, and two of the three aircraft were destroyed. Information on the third is not sufficient to determine whether or not it was destroyed, however, each of the three aircraft was single-engine. Twelve fatalities and three injuries occurred in association with powerplant centered fires while four fatalities and eight injuries were associated with electrical system problems.

Twenty-two of 40 (55 percent) single-engine aircraft inflight fires involved fatalities or injuries, as compared to 10 of 30 (33 percent) twin-engine aircraft. Nine single-engine inflight fires involved fatalities and/or injuries while ten twin-engine aircraft inflight fires involved fatalities or injuries. In this respect, twin-engine aircraft inflight fires may be more serious in outcome than those in single-engine aircraft. Of the problem locations described, above, the powerplant was most important; here, twin-engine aircraft have had 15 of 26 problems in the powerplant area. Unlike other problem areas of the aircraft, the powerplant problems were associated with higher incidence of fatalities compared to injuries (12:3). Next most serious were fuel system problems with seven fatalities to zero injuries. In each case, twins outnumbered single-engine aircraft.

The sample of inflight fires for the five years examined is too small to offer definitive illustrations of problems; however, there is clear indication that powerplant problems dominate. This is significant in the respect that it indicates an avenue for design review or maintenance attention. Less emphasis would be indicated, among General Aviation aircraft, on aircraft interiors.

REVIEW OF 1974-1981 NTSB CAUSE DATA. In an attempt to augment the detailed review of 1979-1983 case files with data from the NTSB computer listings, a separate view of inflight fires was developed. The computer listings showed 153 accidents verifiable as inflight fires. A total of 34 fatalities occurred in 17 of the accidents. The occurrence of inflight fires was shown to be relatively infrequent, as suggested by the following:

TABLE 3. INCIDENCE OF INFLIGHT FIRES AND FATALITIES (1974-1983)

Year	Number of Inflight Fire Accidents	Total Number of Fatalities
1974	17	0
1975	17	3
1976	13	0
1977	20	0
1978	19	4
1979	24	13
1980	14	3
1981	13	8
1982	10	1
1983	6	2
Total	153	34

NTSB RECORDS OF CAUSES OF INFLIGHT FIRES. To determine how NTSB computer records of cause factors for General Aviation inflight fires would correlate with the causal data derived from detailed review of 1979-1983 case files, the NTSB records for the years 1974-1981 were examined. These records predated and overlapped the information in the case files. The NTSB's classifications of "cause" factors are confusing in nature, because they include a mixture of highly judgmental factors relating to contributing causes such as aircraft maintenance and direct causes such as component failures. Eliminating many of the background or contributing cause factors relating to personnel, a general trend toward powerplant involvement is reinforced by the NTSB data. The percentage of inflight fire accidents in which each broad cause category occurred is shown below:

TABLE 4. INCIDENCE OF NTSB CAUSAL FACTORS IN FATAL AND NON-FATAL INFLIGHT FIRE ACCIDENTS EXPRESSED AS PERCENTAGES* (1974-1981)

NTSB Causal Factor	Factor in a Fatal Accident	Factor in a Non-Fatal Accident
Personnel(Maint.& Design)	35.0 %	28.9 %
Powerplant	35.0 %	58.6 %
Systems	12.5 %	19.2 %
Miscellaneous	7.5 %	5.8 %
Airframe	2.5 %	1.0 %
Instruments/Equipment	2.5 %	1.9 %

*Percentages do not total to 100% due to assignment of multiple cause factors to each accident.

NTSB cause factor listings mix factors involved in the accident with those bringing about the accident. Further, they also include factors leading to the accident impact rather than only focusing on the source of the inflight fires. If this difference is understood, it may be seen that powerplants and maintenance factors are leaders in inflight fire involvement. Disregarding crew involvement in the accidents, systems are another key element in inflight fires. Though this analysis is based upon files that have not been verified to the level of the case files in the 1979-1983 inflight fire population, it may be seen that there is rough agreement in the trends shown in the two views of the problem.

POSTCRASH FIRES.

DEGREE OF AIRCRAFT DAMAGE RELATED TO WING CONFIGURATION. In analyzing the effects of wing configuration on damage resulting from postcrash fires, seven types of airfoil configuration were viewed: high wing, low wing, helicopters, bi/triplanes, midwing, autogyro, and sailplanes. A residual group of aircraft were unidentifiable as to wing configuration and were labeled "not available" or NA. Table 5 illustrates the relative population of aircraft for models involved in post impact fires.

TABLE 5. WING TYPE AS A PERCENTAGE OF TOTAL POPULATION OF GENERAL AVIATION AIRCRAFT TYPES INVOLVED IN POST IMPACT FIRES (1974-1983)

Wing Configuration	Total Population of Aircraft Types in Post Impact Fires	% of Total Post Impact Aircraft Population
High	94973	52.3
Low Wing	79461	43.8
Helicopter	3623	2.0
Bi- and Tri-planes	2091	1.2
Mid-wing	973	0.5
Autogyro	35	0.0
Sailplane	40	0.0
Not Available	388	0.2
Total	181584	

Of the 316 aircraft models viewed in this part of the study, the largest proportion of <u>models</u> involved in post impact fires (41.8 percent) was that of low wing aircraft, contrasted to the largest <u>population</u> (52.3 percent) of aircraft being high wing due to the high production of certain high wing models. If NA wing configurations are ignored, the ranking among the wing types, in order of decreasing incidence of post impact fires and fatalities, is constant.

1. Low Wing
2. High Wing
3. Helicopters
4. Bi- and Tri-planes
5. Mid-Wing
6. Autogyro/Sailplane
7. Not available

Table 6 illustrates that this is true for number of accidents, number of aircraft severely damaged, number of aircraft destroyed, number of aircraft with unspecified damage, number of fatalities per wing type, number of fatalities in destroyed aircraft, and number of aircraft with fatalities in unspecified damage aircraft. So, if damage is measured in terms of aircraft damage or fatalities, the ranking of types remains nearly constant. This is not true for number of fatalities in severely damaged aircraft where high wing aircraft are first. However, it must be noted that the absolute number of fatalities in that category is small and is subject to large percentage changes with only a small change in the number of fatalities.

TABLE 6. AIRCRAFT DAMAGE AND FATALITIES VS. WING CONFIGURATION FOR POST IMPACT FIRE ACCIDENTS IN GENERAL AVIATION AIRCRAFT (1974-1983)

Wing Configuration	No. of Accidents	No. of Aircraft Severely Damaged	No. of Aircraft Destroyed	No. of Aircraft w/ Unspecified Damage
High Wing	805	70	671	64
Low Wing	1242	117	1013	112
Helicopter	187	19	153	15
Bi- and Tri- planes	45	1	43	1
Mid-wing	21	0	15	6
Autogyro	1	0	1	0
Sailplane	1	0	0	1
Not Available	49	3	40	6
TOTAL	2351	210	1936	205

Wing Configuration	No. of Fatalities	No. of Fatalities in Severely Damaged Aircraft	No. of Fatalities in Destroyed Aircraft	No. of Fatalities in Aircraft w/ Unspecified Damage
High Wing	241	5	188	48
Low Wing	500	3	338	159
Helicopter	24	1	18	5
Bi- and Tri- planes	12	0	10	2
Mid-wing	8	0	5	3
Autogyro	0	0	0	0
Sailplane	0	0	0	0
Not Available	13	0	8	5
TOTAL	798	9	567	222

Table 7a illustrates the wing type numbers of post-impact fire accidents and fatalities as percentages of the total accident statistics found in Table 6. In Table 7a it may be seen that when the accidents per wing type are compared with the total (2,351), high wing aircraft are involved in about 1/3 while low wing aircraft are involved in slightly over 1/2. Helicopters account for between 7 percent and 9 percent while the other configurations are only residual percentages. When fatalities are viewed as percentages of the total (798), there is greater variation. In general, the high wing aircraft lag the low wing aircraft in severity of outcome, as measured by fatalities. However, in severely damaged aircraft, there is a greater percentage (55.6 percent) of fatalities in the high wing aircraft. This apparent reversal of trend may be due to the small number of fatalities making the calculation too sensitive. All other indicators are that high wing aircraft have a better experience in post impact fires, as measured by aircraft damage and number of fatalities.

When viewing helicopters in the same context, damage and fatalities are relatively close to the proportion of the fire population. Other wing configurations are such small parts of the total study that no strong emphasis should be placed on their data.

TABLE 7. AIRCRAFT DAMAGE AND FATALITIES AS A PERCENTAGE OF TOTAL NUMBER OF POST IMPACT FIRE ACCIDENTS AND FATALITIES IN GENERAL AVIATION AIRCRAFT (1974-1983)
(Comparison as a percent of Total Post Impact Fire Accidents and Fatalities Shown in Table 6)

Wing Configuration	% of Accidents	% of Total Aircraft with Severe Damage	% of Total Aircraft Destroyed	% of Total Aircraft with Unspecified Damage
High Wing	34.2	33.3	34.7	31.2
Low Wing	52.8	55.7	52.3	54.6
Helicopter	8.0	9.0	7.9	7.3
Bi- and Tri-planes	1.9	0.5	2.2	0.5
Mid-wing	0.9	0.0	0.8	2.9
Autogyro	0.0	0.0	0.1	0.0
Sailplane	0.0	0.0	0.0	0.5
Not Available	1.1	1.4	2.1	2.9

Wing Configuration	% of Fatalities	% of Total Fatalities in Severely Damaged Aircraft	% of Total Fatalities in Aircraft Destroyed	% of Total Fatalities in Aircraft with Unspecified Damage
High Wing	30.2	55.6	33.2	21.6
Low Wing	62.7	33.3	59.6	71.6
Helicopter	3.0	11.1	3.2	2.3
Bi- and Tri-planes	1.5	0.0	1.8	0.9
Mid-wing	1.0	0.0	0.9	1.4
Autogyro	0.0	0.0	0.0	0.0
Sailplane	0.0	0.0	0.0	0.0
Not Available	1.6	0.0	1.4	2.3

Table 8 illustrates percentages of damage and fatalities within (horizontally) wing configurations instead of between (vertically) wing configurations as in table 7. In table 8, the percentages remain comparable with 8-10 percent of aircraft severely damaged, 81-84 percent destroyed and 8-9 percent having unspecified damage. Multi-wing and other aircraft are slightly out of this proportion, but the sample in the study is very small and subject to large error. The overall trend of accident severity, as measured by aircraft damage, is that General Aviation aircraft have about four chances in five of being destroyed once an accident results in a post impact fire.

TABLE 8. AIRCRAFT DAMAGE AND FATALITIES AS A PERCENTAGE OF TOTAL NUMBER OF POST IMPACT FIRE ACCIDENTS AND FATALITIES IN GENERAL AVIATION AIRCRAFT (1974-1983)

(Comparison as a percent of Total Post Impact Fire Accidents and Fatalities within type of Wing Configuration Shown in Table 6)

Wing Configuration	% Aircraft per Wing Type Severely Damaged	% Aircraft per Wing Type Destroyed	% Aircraft per Wing Type with Unspecified Damage
High Wing	8.7	83.4	8.0
Low Wing	9.4	81.6	9.0
Helicopter	10.2	81.8	8.0
Bi- and Tri- planes	2.1	95.6	2.2
Mid-wing	0.0	71.4	28.6
Autogyro	0.0	100.0	0.0
Sailplane	0.0	0.0	100.0
Not Available	6.1	81.6	12.2

Wing Configuration	% Fatalities per Wing Type with Severe Damage	% Fatalities per Wing Type in Destroyed Aircraft	% Fatalities per Wing Type with Unspecified Damage
High Wing	2.1	78.0	19.9
Low Wing	0.6	67.6	31.8
Helicopter	4.2	75.0	20.8
Bi- and Tri- planes	0.0	83.3	16.7
Mid-wing	0.0	62.5	37.5
Autogyro	0.0	0.0	0.0
Sailplane	0.0	0.0	0.0
Not Available	0.0	61.5	38.5

If severity is viewed from the aspect of fatalities, there is greater variation in pattern. Here, high wing, helicopters, and multi-wing aircraft have a comparable experience for fatalities in destroyed aircraft. In the unspecified damage category, low wing aircraft have a greater proportion of fatalities. Overall, the high wing aircraft and helicopters are similar to each other and tend to have higher incidence of fatalities than low wing aircraft if the aircraft is destroyed or severely damaged.

Table 9 shows an NTSB summary of relative damage to general aviation aircraft during accidents ocurring in the study period, 1974-1983. This information showns a clear difference in the damage severity between all accidents and fire accidents. For all accidents, severe damage is most common (72.1 percent) while for fire accidents, illustrated in table 9, approximately 82 percent are destroyed.

TABLE 9. GENERAL AVIATION ACCIDENTS (1974-1983)

Totals for ALL accidents excluding agricultural operations and balloons.

YEAR	TOTAL	NO DAMAGE	MINOR	SEVERE	DESTROYED
1974	4002	41	36	2976	1002
1975	3877	27	19	2903	973
1976	3801	28	13	2829	974
1977	3869	28	26	2887	990
1978	4063	21	29	2996	1077
1979	3648	24	23	2703	938
1980	3431	20	15	2465	965
1981	3315	13	18	2257	1059
1982	3117	15	22	2162	947
1983	3007	25	18	2169	830
Total	36130	242	219	26347	9755
Percent		0.7	0.6	72.1	26.7

<u>FREQUENCY OF POSTCRASH FIRES RELATED TO AIRCRAFT MODEL FUEL TYPE, APPROACH SPEED AND GROSS WEIGHT</u>. To achieve a broad understanding of the characteristics of General Aviation fire accidents, the fire population was reviewed for trends among three basic characteristics of the population: fuel type, approach speed, and gross weight.

<u>Fuel Type</u>. For all the aircraft reviewed, there are only two types of fuel used--aviation gasoline and kerosene-based fuel. Though there are several types of aviation gasoline and kerosene in use, the data available from accident records did not permit a more precise description of the two basic fuel types. Table 10 illustrates the accident distribution for fuel type:

TABLE 10. TYPE OF FUEL IN POST-IMPACT FIRES FOR GENERAL AVIATION AIRCRAFT (1974-1983)

FUEL TYPE	Population of Aircraft in Fire Database	Number of Accidents	Number of Fatalities	Number of Fatal Accidents
Aviation Gasoline	176633	2160	685	350
Aviation Kerosene	4306	125	82	18

FUEL TYPE	% of Population of Aircraft in Fire Database	% of Post Impact Fire Accidents	% of Post Impact Fire Accident Fatalities	% of Fatal Post Impact Fire Accidents
Aviation Gasoline	98	94.5	89.3	95.1
Aviation Kerosene	2	5.5	10.7	4.9

The table indicates that the majority of the General Aviation fire population used aviation gasoline. Kerosene fuel is found only in the larger models typically used in business aviation. The fatalities and number of accidents are in similar proportion between the two fuel types for percentage of post-impact fire accidents and percentage of accidents with fatalities. In terms of fatalities, gasoline still is involved in a much higher percentage than kerosene, however, the proportion for kerosene doubles over that measured by accidents. There is no indication in the statistical data about this slight shift in proportion. Other aircraft characteristics may have more of a role in this shift than does fuel type.

Approach Speed. As previously stated, the approach speed of the fire involved aircraft models was determined by using a value of 1.3 times the velocity of stall (at gross weight), for each aircraft. This value was used in dividing the population into six groups of aircraft, each bracketing a speed range of 20 knots. The following table illustrates the distribution:

TABLE 11. FREQUENCY OF POST IMPACT FIRES VS. APPROACH SPEED (1.3 V_s) FOR GENERAL AVIATION AIRCRAFT (1974-1983).

Approach Speed (Knots)	No. of Aircraft in Post Impact Fire Population	Number of Accidents	Number of Fatalities	Number of Fatal Accidents
21.0-40	22191	386	80	43
40.1-60	71391	539	162	96
60.1-80	72509	991	329	159
80.1-100	13621	400	181	70
100.1-120	1819	29	46	10
More than 120	54	2	0	0

Approach Speed (Knots)	% of Total Post Impact Fire Pop.	% of Total Post Impact Fire Acc.	% of Total Post Impact Fire Acc. Fatalities	% of Total Fatal Post Impact Fire Accidents
21.0-40	12.2	16.4	10.0	11.4
40.1-60	39.3	23.0	20.3	25.4
60.1-80	39.9	42.2	41.2	42.1
80.1-100	7.5	17.0	22.7	18.5
100.1-120	1.0	1.2	5.8	2.6
More than 120	0.0	0.1	0.0	0.0

As would be expected, the fire population is typified by relatively slow approach speeds with the largest group being the 60-80 knot range. When General Aviation aircraft involved in post-impact fires are characterized by approach speed, the highest proportion of fatalities and fire accidents also is in the 60-80 knot group; this is in close proportion to the proportion of aircraft in that group's population. It is notable that the 40-60 knot group has approximately half the proportion of involvement in fire accidents and fatalities than the 60-80 knot group. Another distinct shift in proportion is seen in the 80-100 knot group where the proportion of involvement is more than double the group's proportion of the population.

In general, there seems to be a positive association between increasing approach speeds and increasing number of fire-involved accidents and fatalities. In the lowest speed group, those aircraft seem to be somewhat more likely to have a fire than for the accident to be fatal, but the level of involvement is low in comparison to the other groups. In the 100-120 knot group, fatalities are not in proportion to accident experience. Again, the data does not permit identification of a reason for these trends.

Gross Weight. In describing the fire population in terms of gross weight, twelve weight groups were established. The fire involved aircraft were distributed among these groups with the results illustrated in the table, below:

TABLE 12. POST IMPACT FIRE FREQUENCY VS. AIRCRAFT GROSS WEIGHT FOR GENERAL AVIATION AIRCRAFT (1974-1983).

Gross Weight (lbs.)	Population of Aircraft Types with Post Impact Fires	Number of Accidents with Post Impact Fires	Number of Fatalities in Post Impact Fires	Number of Fatal Acc. in Post Impact Fires
0-1500	23267	256	58	41
1501-2500	92210	776	217	124
2501-3500	37957	585	191	87
3501-4500	4594	82	28	13
4501-5500	11921	222	59	29
5501-6500	5130	149	57	26
6501-7500	2021	66	46	13
7501-8500	417	25	16	6
8501-9500	1603	104	54	24
9501-10500	1141	20	18	4
10501-11500	40	3	0	0
11501-12500	1282	17	31	6
				373

Gross Weight (lbs.)	Population % of Aircraft Types with Post Impact Fires	% of Total Accidents with Post Impact Fires	% of Total Fatalities in Post Impact Fires	% of Total Fatal Acc. in Post Impact Fires
0-1500	12.8	11.1	7.5	11.0
1501-2500	50.8	33.7	28.0	33.2
2501-3500	20.9	25.4	24.6	23.3
3501-4500	2.5	3.6	3.6	3.5
4501-5500	6.6	9.6	7.6	7.8
5501-6500	2.8	6.5	7.4	7.0
6501-7500	1.1	2.9	5.9	3.5
7501-8500	0.2	1.1	2.1	1.6
8501-9500	0.9	4.5	7.0	6.4
9501-10500	0.6	0.9	2.3	1.1
10501-11500	0.0	0.1	0.0	0.0
11501-12500	0.7	0.7	4.0	1.6

For gross weight, the distribution of the population shows clear bias toward the lower weights typical of smaller two to four passenger General Aviation aircraft. Seventy percent of the aircraft involved in post-impact fires were in the 0-3500 pound weight group, however, the percentages of involvement for this group of three weight categories is less than its proportion of the population:

Percent of Population = 84.5
Percent of Fire Accidents = 70.2
Percent of Fatalities = 60.1
Percent of Fatal Accidents with Fire = 67.5

Their fire experience is better than their proportion of the population would indicate. On the other hand, aircraft in the 5500-10,500 pound groups had a worse fire experience than their proportion of the population. Fire and fatality seem more likely in the heavier aircraft than in the lighter aircraft. The relatively few aircraft weighing more than 10,500 pounds would be larger, high-performance aircraft, often turbine powered. Many of these aircraft would be built to different certification standards from the smaller aircraft and would be expected to have differing crashworthiness characteristics from the "light" aircraft in the lower part of the distribution.

RELATIONSHIP OF POSTCRASH FIRE FATALITIES TO NUMBER AND SIZE OF EXITS. Of the data collected on attributes of aircraft models involved in fires, exit size, and number was the least available. For the population, the models on which exit size data were available totaled up approximately 58 percent of the accidents and 65 percent of the fatalities. Where the information was available, it usually described the number of exits, but rarely the size of all the exits. Where size was available, it was generally for the main or normal entry opening. For this reason, the possibilities for analysis were limited.

TABLE 13. PROFILE OF POST IMPACT FIRE ACCIDENTS VS. NUMBER OF EXITS FOR GENERAL AVIATION AIRCRAFT (1974-1983)

No. of Exits	No. of Accidents	No. of Fatalities	Total Population for Aircraft Types in Post Impact Fires
Not Available	106	34	7842
Open Cockpit	4	0	140
1	766	224	52901
2	1233	471	107700
3	170	50	10724
4	69	19	2217
6	3	0	48
	2351	798	181572

(Table 13 continued on next page)

TABLE 13 (continued). PROFILE OF POST IMPACT FIRE ACCIDENTS VS. NUMBER OF EXITS FOR GENERAL AVIATION AIRCRAFT (1974-1983)

No. of Exits	% of Accidents	% of Fatalities	% of Total Population for Aircraft in Post Impact Fires
Not Available	4.5	4.3	4.3
0	0.2	0.0	0.1
1	32.6	28.1	29.1
2	52.4	59.0	59.3
3	7.2	6.3	5.9
4	2.9	2.4	1.2
6	0.1	0.0	0.0

Reference to table 13 shows the experience of fire related accidents and accident fatalities compared to number of exits. For the study group, it can be seen that aircraft with two exits were most involved in fire accidents, followed by aircraft with one, three, and four. The trend is for greatest involvement among aircraft with two exits, which are the most common aircraft in the General Aviation fleet.

Where number of fatalities and accidents is compared to number of exits and exit size, table 14, no change is evident. Two exit aircraft still are the most commonly involved. The exit size indicated in the study groupings is only for the main entry way. The other exits are not represented except in the count of the exit numbers.

TABLE 14. RELATIONSHIP OF FATALITIES TO NUMBER AND SIZE OF EXITS FOR POST IMPACT FIRE ACCIDENTS AMONG GENERAL AVIATION AIRCRAFT (1974-1983)

	Number of Exits					
	Zero		One		Two	
Exit Size (Diagonal Measurement)	No. of Accidents	No. of Fatalities	No. of Accidents	No. of Fatalities	No. of Accidents	No. of Fatalities
Not Available	4	0	256	65	423	111
2.7-3.0 ft.	0	0	0	0	8	2
> 3.0-3.5 ft.	0	0	0	0	1	0
> 3.5-4.0 ft.	0	0	10	3	117	18
> 4.0-4.5 ft.	0	0	404	110	504	221
> 4.5-5.0 ft.	0	0	77	43	111	80
> 5.0-5.5 ft.	0	0	2	0	67	39
> 5.5 ft.	0	0	17	3	2	0
	4	0	766	224	1233	471

(Table 14 continued on next page)

TABLE 14 (continued). RELATIONSHIP OF FATALITIES TO NUMBER AND SIZE OF EXITS FOR POST IMPACT FIRE ACCIDENTS AMONG GENERAL AVIATION AIRCRAFT (1974-1983)

Exit Size (Diagonal Measurement)	Three: No. of Accidents	Three: No. of Fatalities	Four or More: No. of Accidents	Four or More: No. of Fatalities	Not Available: No. of Accidents	Not Available: No. of Fatalities
Not Available	8	3	25	6	106	34
2.7-3.0 ft.	0	0	0	0	0	0
> 3.0-3.5 ft.	0	0	0	0	0	0
> 3.5-4.0 ft.	15	10	4	2	0	0
> 4.0-4.5 ft.	131	36	0	0	0	0
> 4.5-5.0 ft.	15	1	23	5	0	0
> 5.0-5.5 ft.	0	0	20	6	0	0
> 5.5 ft.	1	0	0	0	0	0
	170	50	72	19	106	34

For size of exits, aircraft in the 4-4.5 ft. exit size group were first in accident count for each number group except "four or more." In that group, the accident totals were more comparable than in the other groups. For number of fatalities in each group, the 4.0-4.5 ft. group again ranked first in three of four cases. In general, it appears that fatalities and accident numbers are associated with frequency of exposure, the two exit aircraft being most common in the general aviation fleet.

<u>NUMBER OF POSTCRASH FIRE ACCIDENTS BY AIRCRAFT MODEL VS. POPULATIONS OF THE MODELS</u>. This section examines the occurrence of fire after an aircraft is already involved in the accident process. This kind of accident is sometimes called a "post-crash" fire. A more precise description is found in the term used by the NTSB for this kind of accident: post-impact fires. As the term implies, fire is not present until an aircraft has struck or "impacted" something. The impact damages the aircraft, and fire ensues.

Analysis of the post-impact fire data sought answers to several questions. The first question was whether post-impact fires occurred with unexpected frequency in any of the general aviation aircraft models.

To determine this, the expected frequency of post-impact fire occurrences had to be identified for each model so an expected performance value would be available for comparison. Identification of the expected performance value was approached by considering how many accidents would be expected if every aircraft model achieved the same level of safety performance as every other model in the general aviation fleet. If safety performance were uniform (or "average"), accidents would be distributed among aircraft models in proportion to their share of the general aviation aircraft population. Thus, an aircraft model's ratio of its population to the total population, expressed as a percentage, also would represent its expected accident performance.

To illustrate, NTSB data contain 36,130 total accidents for the general aviation fleet in the ten-year study period. If one model constitutes one percent of the general aviation aircraft population, it would be expected to have experienced one percent of all types of general aviation accidents, or 361.3 accidents. This logic would hold true for each model of aircraft, if every aircraft achieved uniform or "average" performance.

Fire accidents are but one of the many types of accidents making up the total accident count for the general aviation aircraft fleet. Again, if all aircraft models had identical fire experience, the average number of each type of accident experienced by each model would also occur in proportion to the model's share of the total population. By approaching the data this way, the expected number of fire accidents for each model are represented by the ratio of the model's population to the total number of aircraft in the general aviation fleet.

The actual post-impact fire accidents must then be considered in the context of the accident picture, that is, by the ratio (expressed as a %) of the number of fires to the total accident count. For the general aviation fleet, the 2,351 post-impact fires are a ratio of about 6.5 percent of the accidents. By comparing this ratio and the ratio of fire accidents actually observed for each model, an indication of the model's relative involvement in post-impact fires can be derived.

Aircraft Ratio - Accident Ratio = Difference

The difference in the two ratios suggests whether or not a model had more or less fires than expected. A difference near zero (0) suggests that a model's performance was essentially average. If the value of the difference is positive (difference > 0), other types of accidents may be a bigger accident problem than the fire problem for that model. If the difference has a negative value, accidents with post-impact fires may be bigger problem than expected for that model. However, actual execution of this approach directly would involve knowledge of the total number of accidents for each aircraft model.

Appendix D provides a listing of every aircraft model for which model population data were available, except that models with an average population of ten or less over the ten-year period were arbitrarily excluded. The rationale was that such a small population would probably not be worth acting on even if the findings suggested worse than average performance. Ratios were calculated as percentages of the total fleet population or the total accident population represented by each model. This resulted in the analysis of 205 models with a population of 181,462 aircraft or 78.7 percent of the fleet, and 2,275 accidents or over 96.7 percent of the total accidents involving post-impact fires experienced by the entire general aviation fleet.

A question rises concerning the comparative performance among aircraft models which experienced accidents with post-impact fires. For this analysis, the same segment of the general aviation population which experienced post-impact fires was analyzed. However, this time the expected occurrences were normalized against the populations and accidents of the sample group of models. That population consisted of 205 models and 181,462 aircraft. The accident count was 2,275 post-impact fires for the group. As before, a difference in the zero range suggests that the model experienced about the number of fires that would be expected, while a negative difference suggests that the model tended to have more fires than the average, and a positive difference suggests it tended to have less fires than than average.

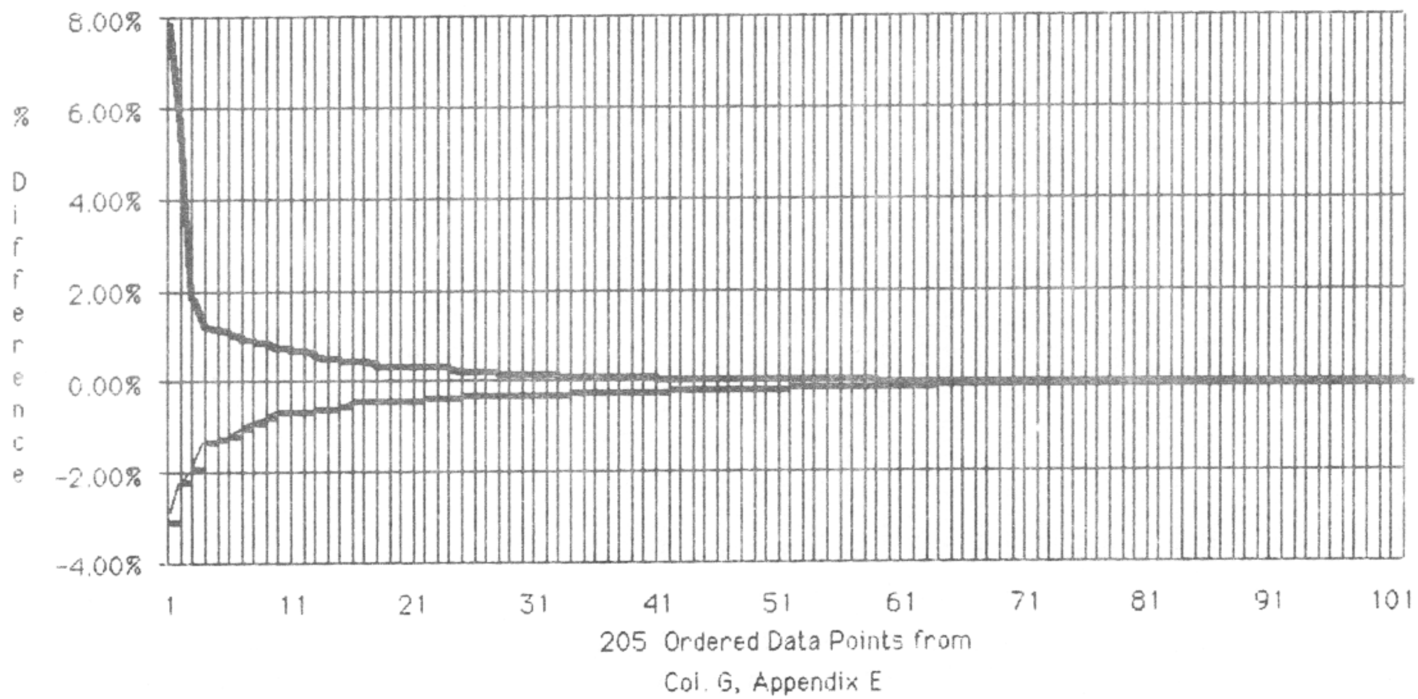
The data on which this analysis was based, and the differences are shown in appendix E. The data were sorted and presented in order of the ascending value of the differences. The distribution of the differences is also shown in figure 1. The observed differences ranged from a low of - 3.0672 percent to a high of 7.8636 percent. The median value was 0.-0335 percent and the computed value of the mean, of course, was 0.0000 percent. The standard deviation for the differences was 0.81775 percent.

The models with the largest populations tended to bunch near the bottom of Column G of appendix E, which shows the differences in order of their ascending value.

RELATIONSHIP OF POSTCRASH FIRE FREQUENCY VS FATALITY FREQUENCY. To examine the relative performance of aircraft models when a post-impact fire occurred, accidents involving post-impact fires with fatalities were analyzed. Because of the differences in the number of occupants a model can carry, differences in the number of fatalities associated with each model would not be a good indicator of the comparative performance among aircraft in fires. Considering the available data, the most definitive approach was to use the number of accidents with fatalities to indicate performance. The population used for this analysis included all models for which population data for the study period were available, and for which one or more accidents with fatalities and post-impact fire were recorded. One hundred six models, with a total population of 156,795 aircraft representing 68 percent of the total general aviation aircraft population were used for this analysis. Those models experienced 2,036 post-impact fire accidents (86 percent of the total general aviation accidents with post-impact fire) of which 368 accidents had both a post-impact fire and one or more fatalities.

For this group of models, the ratio of the aircraft's accidents with post-impact fires as portion of the total post-impact fires for the group was calculated, as a %, to determine the distribution of such accidents among the models.

Figure 1. Distribution of Differences in Ratios (as %) of Group's Aircraft Population vs Group's Post-Impact Fires



$$\text{accident ratio} = \frac{\text{Number of accidents with post-impact fires (for a model)}}{\text{Total accidents experienced by this sample population (2036)}} \times 100$$

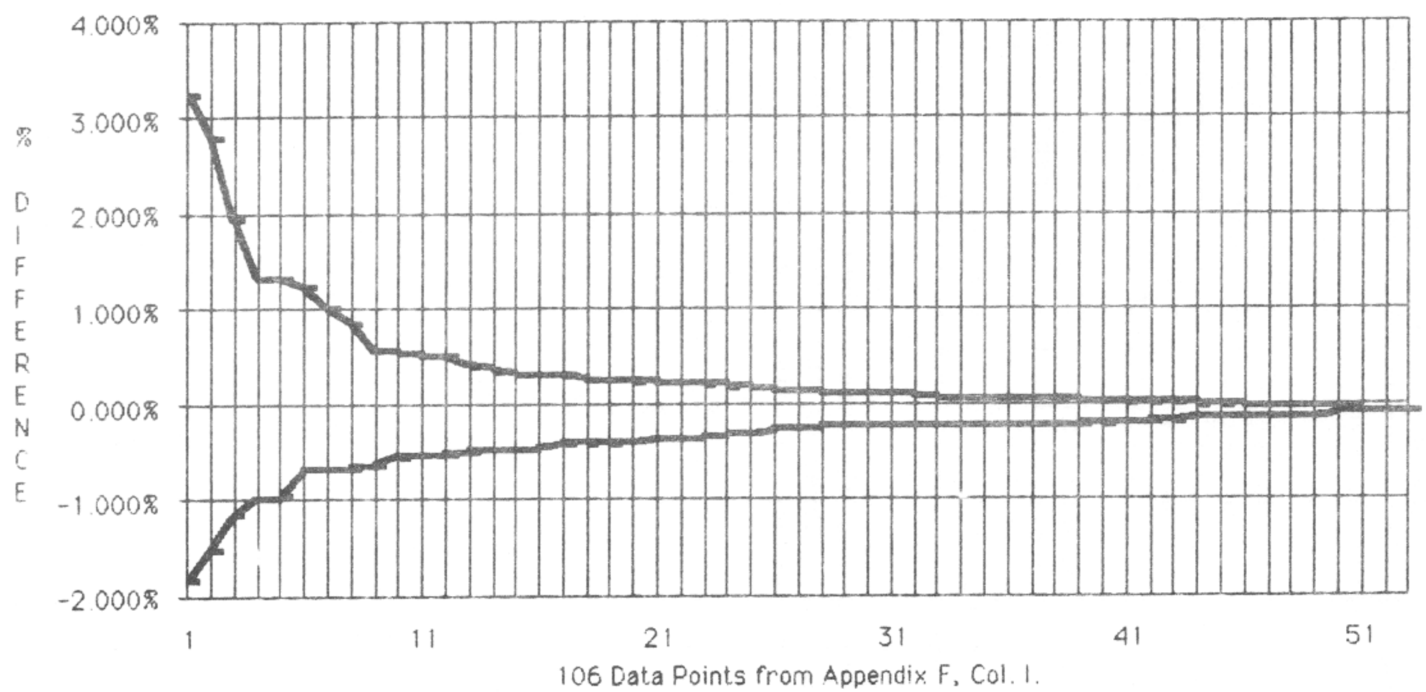
The aircraft's ratio of fires with fatalities to the group's total accidents with fires was then calculated to determine the distribution of accidents with fire and fatalities among the models.

$$\text{fatality ratio} = \frac{\text{Number of fatal accidents with post-impact fires (for a model)}}{\text{Total fatal accidents experienced by this sample population (368)}} \times 100$$

The differences in ratios were thus identified. These data are summarized and presented, ordered according to the differences, in appendix F. The distribution of the 106 differences was plotted and is shown in figure 2. The median for these ratio differences is -0.075 percent, and the mean is, of course, 0.0000 percent. The standard deviation for these differences is 0.6567 percent.

The bunching of the models with the highest number of aircraft in service was noted in this analysis. Three of the models with 58,188 aircraft showed the greatest positive difference in this series.

Figure 2. Distribution of Differences in Ratios (as %), Aircraft Post-impact Fires vs Fatal Accidents



PURPOSE

Any improvements regarding General Aviation aircraft fire safety must evolve from an understanding of aircraft systems aspects that may influence the frequency or severity of aircraft fires. This part of the study is an attempt to identify trends in the materials used in General Aviation aircraft interiors.

To accomplish this task, the Statement of Work required an evaluation of the twenty most common aircraft models in use over the last ten years. The aircraft model years selected for the study were 1974-1983, inclusive, in order to coincide with the most recent fire accident data available from the NTSB (see section I).

DATA SOURCES

The FAA list of United States civil registered aircraft was utilized to determine the 20 most common General Aviation aircraft. Listings of cabin materials were obtained from the original aircraft manufacturers for 19 of the 20 models identified. In the case of the Grumman AA-5, which is no longer in production, it was necessary to examine several aircraft of this type in service.

DATA SEARCH

The 20 most common or populous General Aviation aircraft were selected by totaling aircraft for the model years 1974-1983. They were selected based upon the number of each aircraft make and model registered with the FAA as of December 31, 1984.

Only those aircraft with a maximum gross weight of less than 12,501 pounds were to be considered during the selection of the 20 most common aircraft. When counting the various makes and models of aircraft, it was necessary to combine certain models of the same manufacturer when the performance characteristics of each model were similar (e.g., the Piper PA-28 series, Beech 23 series, etc.).

Table 15 lists the 20 most common aircraft selected for the study period. The aircraft models are ranked according to the total number of each during the ten-year period. The table also indicates the individual model series that were combined where appropriate.

Developing the list of cabin materials for these aircraft was accomplished by contacting the aircraft manufacturers. Some difficulty was experienced in this task due to the decreased production of General Aviation aircraft since 1980. In some instances, those individuals responsible for cabin materials were no longer employed by the manufacturers. Delays were experienced in contacting the appropriate personnel as a result of these layoffs, and it was necessary for the manufacturers' existing staff members to research the materials. It should be mentioned that all of the companies contacted were cooperative in this effort.

TABLE 15. THE TWENTY MOST COMMON MAKES AND MODELS OF GENERAL AVIATION AIRCRAFT PRODUCED DURING 1974-1983*

Manufacturer	Model	10-Year Production Total
1. Cessna	172 Series	11,626
2. Cessna	150/152 Series	8,298
3. Piper	PA-28 Series (a)	6,205
4. Cessna	182 Series	5,197
5. Cessna	210 Series	3,734
6. Piper	PA-32 Series (b)	2,630
7. Beech	Bonanza Series (c)	2,520
8. Mooney	M20 Series	2,085
9. Piper	PA-28R Arrow	2,060
10. Beech	Baron Series (d)	1,740
11. Cessna	206	1,698
12. Grumman	AA-5	1,639
13. Cessna	400 Series (Piston)	1,616
14. Piper	PA-38 Tomahawk	1,497
15. Piper	PA-34 Seneca	1,494
16. Piper	PA-31 Series (Piston)	1,413
17. Beech	King Air Series	1,391
18. Bell	206 Series	1,369
19. Beech	Model 23 Series (e)	1,287
20. Cessna	177 Cardinal Series	1,235

* Source: FAA list of U.S. civil registered aircraft as of December 31, 1984.

(a) Fixed-gear models except for 235, Dakota, etc.
(b) Includes fixed and retractable gear models
(c) Includes models 33, 35, and 36
(d) Includes models 55, 58, 58P, etc.
(e) Includes Musketeer, Sport, Sundowner and Sierra

In the case of the Grumman AA-5, it was necessary to survey several of these aircraft in service in order to catalog the cabin materials, since this aircraft is not in production. All of the aircraft surveyed appeared to have the original factory materials installed, and this was verified with maintenance personnel familiar with this type aircraft.

DISCUSSION

Table 16 lists, in alphabetical order, the cabin materials in the 20 most common makes and models of general aviation aircraft. Table 17 displays, in matrix format, these same materials and shows their application in specific parts of the aircraft models. Many of the materials in these aircraft are "household" items, e.g., leather, nylon, vinyl, wool, plexiglas and polyurethane foam. There also is commonality of materials usage among the various manufacturers. Some materials are utilized in specific cabin areas regardless of the manufacturer, e.g., plexiglas is used for windows, seat

Cessna changed some materials in the aircraft models examined during the ten-year study period. Before 1979, floor coverings consisted of nylon or wool in Cessna single-engine aircraft. Beginning in 1979, nylon only was used in these aircraft. Nylon or wool was used for floor coverings during the ten-year period in Cessna multi-engine aircraft, except for the Cessna 400 series multi-engine aircraft which also used rayon for this purpose.

Cessna also changed the headliner material in all models during the study period. Prior to 1982, Ensolite laminated to semi-rigid Royalite #22 was used. The product Royalite is a blend of ABS and other plastics (PVA, PVC, etc.). ABS is acrylonitrile butadiene styrene. Beginning in 1982, the headliner was constructed of vinyl supported with wires.

Beech aircraft had the greatest variation in materials among the manufacturers reviewed during the study period. Prior to 1979, acrylic fabric was used for floor covering, with nylon and wool being used exclusively after 1979. Seat and sidewall upholstery consisted of acrylic, cotton, leather, mohair, nylon, rayon, wool and various combinations of these materials. Headliner upholstery consisted of ABS plastic, vinyl and wool, with wool being utilized only in the King Air series.

The materials from which window moldings were made are:

ABS Plastic,
Acrylic/PVC (Kydex)
Epoxy/open weave fiberglas/aluminum honeycomb
Nitrile PVC(ABS)/epoxy fiberglas/Nomex honeycomb, and
Polycarbonate.

The acrylic/PVC was used in the Baron and Bonanza (1974-1979), King Air (1974-1976) and Model 23 (1974-1984). ABS plastic was used in the King Air (1974-1976). Polycarbonate was used in the Baron and Bonanza (1980-1985) and the King Air (1979-1982). Epoxy/open weave fiberglas/aluminum honeycomb was used in the King Air (1974-1982). Nitrile PVC/epoxy fiberglas/Nomex honeycomb was used in the King Air (1984-1985).

The Mooney M20 also had variations in seat upholstery materials, utilizing any of the following: cotton, leather/suede, nylon, vinyl, or wool. Sidewall coverings consisted of Foam Core (polystyrene) covered with one of the previously mentioned interior fabrics.

Fire accidents in General Aviation, both inflight and postcrash, accounted for only 6.5 percent (2,351) of the accidents during the study period of 1974-1983. Of the fire accidents, only 6 percent were inflight. When the fire accidents are viewed from the aspects of size, speed or configuration, they generally follow the characteristics of the total General Aviation aircraft population. Those aircraft most common in the total population are most common in the fire population. Further, those aircraft which were included in this study, because they had incidence of post-impact fires and fatalities, are generally represented in proportion to their proportion of the entire population.

When compared to damage occurring to aircraft in all General Aviation aircraft accidents, the damage from fire accidents is more serious. Eighty two percent of the aircraft involved in fires are destroyed, as compared to 26.7 percent of the aircraft involved in all General Aviation accidents. In the lesser category of severe damage, nine percent of the fire accident aircraft population was severely damaged compared to 72.1 percent of the aircraft involved in all General Aviation accidents. The disparity in destruction may be due as much to lack of firefighting capability in the General Aviation community as to any other factor. From the standpoint of aircraft damage, the General Aviation fire appears to be an infrequent but more serious type of accident than all accidents viewed together.

Due to the uncertainties in the data available, few well defined trends can be seen in General Aviation fires. Inflight fires seem clearly associated with powerplant or powerplant component malfunctions. Engine compartments lead as a fire origin point for both single- and twin-engined aircraft. The exhaust system causes many of the fires among twin-engine aircraft; the notable feature of single-engine inflight fires is that they, alone, have the instrument panel as a fire source.

Wing configurations seem to make a difference in the severity of post-impact fire accident outcomes, when measured by both damage and fatalities. Low-winged aircraft seem to have more severe outcomes than those with high wings. Helicopters seem to have more problem with damage than fatalities, suggesting that fires are not the problem for that type of airframe. No clear trends other than those reflecting the general makeup of the General Aviation aircraft population can be seen for postcrash fires. Most involve aircraft fueled by aviation gasoline, and most are in the less than 3,500 pound weight category. Fatality rates rise somewhat as the basic approach speeds of General Aviation aircraft increase, suggesting that impact speeds may be more of a factor in survival than fires. The aircraft with two exits is the most common among the General Aviation fire population, and it is the most common type of aircraft in the total population.

The trend among the models of aircraft involved in fires was to closely follow the average incidence of accidents and fatalities. Only a few aircraft could be said to significantly depart from the average either in low record of fatalities/low incidence of fire accidents or high fatality/incidence count.

Overall, data regarding General Aviation fires was found to be scarce and often inaccurate. Recent changes in the investigation program of the FAA and

NTSB promise to improve the collection of data on fires, however, improved computer handling and access processes need to be developed to ensure the data is not modified during entry and that it is more easily and flexibly accessible.

The materials used in General Aviation aircraft during the ten-year period, 1974-1983, are predominantly conventional manmade or natural materials. Unlike experience in transport aircraft, the materials in General Aviation craft are very much like those found in the average home. Polyurethane foam cushioning, wool and nylon fabrics, and ABS plastic or aluminum typify the types of materials found in these aircraft.

APPENDIX A

DATA RELATING TO GENERAL AVIATION AIRCRAFT ACCIDENTS INVOLVING POST-IMPACT FIRES 1974-1983

APPENDIX A DATA RELATING TO GENERAL AVIATION AIRCRAFT ACCIDENTS INVOLVING POST-IMPACT FIRES, 1974-1983

AIRCRAFT MAKE	AIRCRAFT MODEL	ACCIDENTS INVOLVING POST-IMPACT FIRES	NUMBER OF FATALITIES	NUMBER OF FATAL ACCIDENTS	FUEL TYPE	WING CONFIGU-RATION	NUMBER OF EXITS	PRIMARY EXIT DIAGONAL DIMENSION (FEET)	APPROACH SPEED (KNOTS)	GROSS WEIGHT (LBS)	AVERAGE POPULATION DURING PERIOD 1974-83
ACRODUSTER	1/HB	1	0	0	AVGAS	BI	1	NA	79.3	NA	8.6
AERO COMDR	100	2	0	0	AVGAS	HI	2	4.48	54.6	2250	NA
AERO COMDR	112	4	0	0	AVGAS	LO	2	3.93	67.6	2600	463.7
AERO COMDR	114	2	0	0	AVGAS	LO	2	4.12	70.2	3272	253
AERO COMDR	200-D	1	0	0	AVGAS	LO	1	4.42	61.1	3000	66
AERO COMDR	500	4	1	1	AVGAS	HI	1	4.27	68.9	6500	348.6
AERO COMDR	520	2	0	0	AVGAS	HI	1	NA	67.6	5500	65
AERO COMDR	560	7	1	1	AVGAS	HI	1	4.27	95.55	6750	171.4
AERO COMDR	680	17	14	5	AVGAS	HI	1	4.47	96.20	7000	348.6
AERO COMDR	690	5	2	1	JET A	HI	2	4.50	100.1	10250	39
AERONCA	11AC	4	0	0	AVGAS	HI	1	NA	33	1200	741
AERONCA	15AC	1	0	0	AVGAS	HI	NA	NA	59.8	2050	691.3
AERONCA	65-TAL	1	0	0	AVGAS	HI	2	NA	33	NA	136.7
AERONCA	7AC	7	1	1	AVGAS	HI	1	NA	33	1220	2186
AERONCA	7BCM	3	2	1	AVGAS	HI	NA	NA	NA	1220	209.7
AERONCA	7DC	1	0	0	AVGAS	HI	NA	NA	NA	1300	149
AERONCA	KCA	1	0	0	AVGAS	HI	1	NA	28	NA	9.3
AEROSPATIALE	315B	7	0	0	JET A	HELO	2	NA	N/A	4300	51.9
AEROSPATIALE	341G	1	0	0	JET A	HELO	4	4.77	NA	3970	48.4
AEROSPATIALE	350	2	0	0	JET A	HELO	2	NA	NA	4300	NA
AEROSPATIALE	360C	1	0	0	JET A	HELO	4	5.33	N/A	6400	11.1
AEROSPATIALE	SE3180	1	0	0	JET A	HELO	2	NA	NA	3500	NA
AEROSTAR	600	4	0	0	AVGAS	MID	2	2.71	87.1	5500	199.3
AEROSTAR	601	2	0	0	AVGAS	MID	2	3.55	89.7	5700	123.3
AEROSTAR	601P	12	7	2	AVGAS	MID	3	3.55	92.95	6000	364.3
BEDE	BD4	4	0	0	AVGAS	HI	0	NA	49	NA	139.9
BEDE	BD5A	2	0	0	AVGAS	LO	1	NA	72.80	NA	56.4
BEDE	BD5B	2	1	1	AVGAS	LO	1	NA	61.10	959	51
BEECH	100	3	1	1	JET A	LO	2	NA	96.85	11800	155.3
BEECH	18(D-G18S,18C45)	80	31	20	AVGAS	LO	1	4.40	87.10	9500	815.3
BEECH	19(23-19,19,A19)	7	4	1	AVGAS	LO	1	4.60	63.70	2200	249.3
BEECH	19(B19)	10	0	0	AVGAS	LO	2	4.60	63.90	2150	315
BEECH	200	3	21	3	JET A	LO	2	4.83	101.08	12500	591
BEECH	23(23-B23)	23	6	3	AVGAS	LO	1	4.60	68.25	2350	1716
BEECH	24(23R)	14	16	6	AVGAS	LO	1	4.60	74.75	2550	562.7
BEECH	33	14	4	2	AVGAS	LO	1	4.30	68.06	3000	1511.8
BEECH	35(A-P)	79	27	4	AVGAS	LO	3	4.30	65.00	2887	6882.6
BEECH	36	19	17	7	AVGAS	LO	2	5.02	72.48	3600	1165.1
BEECH	50(50-C50)	5	2	1	AVGAS	LO	1	NA	58.00	5750	346.1
BEECH	55	43	9	4	AVGAS	LO	3	4.30	91.95	5100	2245.7
BEECH	56TC	1	0	0	AVGAS	LO	1	4.30	94.9	5990	61
BEECH	58	11	3	2	AVGAS	LO	4	5.02	95.55	5450	919
BEECH	58P	6	5	2	AVGAS	LO	2	4.30	101.83	5995	336.3
BEECH	58TC	3	0	0	AVGAS	LO	4	5.02	101.83	6100	103.7
BEECH	60	11	1	1	AVGAS	LO	2	4.53	96.85	6725	85.7

AIRCRAFT MAKE	AIRCRAFT MODEL	ACCIDENTS INVOLVING POST-IMPACT FIRES	NUMBER OF FATALITIES	NUMBER OF FATAL ACCIDENTS	FUEL TYPE	WING CONFIGU-RATION	NUMBER OF EXITS	PRIMARY EXIT DIAGONAL DIMENSION (FEET)	APPROACH SPEED (KNOTS)	GROSS WEIGHT (LBS)	AVERAGE POPULATION DURING PERIOD 1974-83
BEECH	65	16	3	2	AVGAS	LO	1	6.23	91.56	8250	107.7
BEECH	76/77	3	1	1	AVGAS	LO	2	4.48	78.00	3916	341.7
BEECH	90(B90)	13	14	2	JET A	LO	1	4.90	96.20	9650	956.3
BEECH	95	9	0	0	AVGAS	LO	3	4.30	61.00	4200	309
BEECH	99	3	0	0	JET A	LO	3	4.86	NA	10650	39.8
BEECH	D-17S	1	2	1	AVGAS	BI	2	NA	43.50	NA	124
BEECH	T34	7	3	2	AVGAS	LO	2	NA	63.70	2950	52.3
BEECH-VOLPAR	H18	1	0	0	JET A	LO	1	NA	NA	9700	NA
BELL	204	2	0	0	JET A	HELO	4	NA	N/A	8500	2.3
BELL	205A	3	0	0	JET A	HELO	6	NA	N/A	9500	48
BELL	206	23	1	1	JET A	HELO	2	NA	N/A	3200	258
BELL	222	1	3	1	JET A	HELO	3	NA	N/A	8250	24.7
BELL	47G	55	7	5	AVGAS	HELO	2	NA	N/A	2950	961.5
BELL	47J	14	1	1	AVGAS	HELO	4	NA	N/A	2900	91.7
BELL-SOLOY	47G	2	1	1	JET A	HELO	2	NA	N/A	NA	NA
BELLANCA	14-13	6	3	1	AVGAS	LO	1	NA	50.70	2100	245.7
BELLANCA	14-19	3	0	0	AVGAS	LO	1	3.95	63.05	2600	1539.9
BELLANCA	17(30,31)	7	3	1	AVGAS	LO	1	3.95	65.2	3200	201.3
BELLANCA	17(30A,31A)	8	3	1	AVGAS	LO	1	4.09	79.30	3325	727.7
BELNCA/CHAMP	7ECA	5	0	0	AVGAS	HI	1	4.36	57.85	1650	940.3
BELNCA/CHAMP	7GC	4	1	1	AVGAS	HI	NA	NA	NA	1650	512.7
BELNCA/CHAMP	7GCAA	2	0	0	AVGAS	HI	1	4.36	56.88	1650	153.8
BELNCA/CHAMP	7GCB	2	0	0	AVGAS	HI	NA	NA	NA	1650	53.3
BELNCA/CHAMP	7GCBC	15	4	2	AVGAS	HI	1	4.36	50.70	1650	537.2
BELNCA/CHAMP	7KCAB	11	2	2	AVGAS	HI	1	4.36	57.85	1650	327
BELNCA/CHAMP	8GCBC	10	1	1	AVGAS	HI	1	4.36	58.50	2150	216
BENCHMARK	01	1	0	0	NA	NA	NA	NA	NA	NA	NA
BOEING	KAYDET-STEARMAN	9	2	1	AVGAS	BI	2	NA	45.00	NA	NA
BOLKOW	BO-105	1	0	0	JET A	HELO	4	4.92	N/A	NA	58.1
BRANTLY	305	2	0	0	AVGAS	HELO	2	4.28	N/A	2900	14.4
BRANTLY	B-2	3	1	1	AVGAS	HELO	2	3.81	N/A	1670	51.7
BREEZY/HB	I	1	0	0	AVGAS	HI	3	NA	34.00	NA	73.5
BUEHLER	EXEC	1	0	0	JET A	LO	NA	NA	NA	NA	1
BUSHBY/HB	MM-I	2	0	0	AVGAS	LO	1	NA	66.95	NA	71.7
BUSHBY/HB	MM-II	1	1	1	AVGAS	LO	2	NA	63.70	NA	58.8
CALDWELL	FOLKER	1	0	0	NA	NA	NA	NA	NA	NA	NA
CESSNA	120	4	0	0	AVGAS	HI	2	NA	35.50	1500	917.1
CESSNA	140	5	0	0	AVGAS	HI	2	NA	35.50	1500	2481.6
CESSNA	150	95	17	10	AVGAS	HI	2	3.77	55.25	1550	17682.6
CESSNA	170	17	6	4	AVGAS	HI	2	NA	59.15	2200	2578.2
CESSNA	172	88	25	15	AVGAS	HI	2	4.41	56.94	2300	21288.7
CESSNA	175	6	0	0	AVGAS	HI	2	NA	57.85	2400	1410.5
CESSNA	177	26	15	7	AVGAS	HI	2	5.42	60.00	2450	2737.7
CESSNA	180	13	0	0	AVGAS	HI	2	3.91	64.00	2675	2603.3

AIRCRAFT MAKE	AIRCRAFT MODEL	ACCIDENTS INVOLVING POST-IMPACT FIRES	NUMBER OF FATALITIES	NUMBER OF FATAL ACCIDENTS	FUEL TYPE	WING CONFIGU-RATION	NUMBER OF EXITS	PRIMARY EXIT DIAGONAL DIMENSION (FEET)	APPROACH SPEED (KNOTS)	GROSS WEIGHT (LBS)	AVERAGE POPULATION DURING PERIOD 1974-83
CESSNA	182	90	27	23	AVGAS	HI	2	4.45	63.70	2550	3150.4
CESSNA	185	18	7	4	AVGAS	HI	2	5.12	64.10	3200	1200.5
CESSNA	195	7	3	3	AVGAS	HI	2	NA	70.85	3350	468.6
CESSNA	205	1	0	0	AVGAS	HI	3	NA	NA	3300	258
CESSNA	206	22	8	2	AVGAS	HI	2	4.85	69.33	3450	2352.5
CESSNA	207	12	1	1	AVGAS	HI	3	4.88	75.66	3800	246.3
CESSNA	210	62	28	13	AVGAS	HI	2	NA	70.59	3400	4754.4
CESSNA	210(P)	1	0	0	AVGAS	HI	2	4.46	75.4	4000	NA
CESSNA	304A	1	0	0	AVGAS	NA	NA	NA	NA	5990	NA
CESSNA	310	55	8	5	AVGAS	LO	1	NA	86.13	4800	2978.3
CESSNA	320	14	3	2	AVGAS	LO	1	NA	NA	NA	353.8
CESSNA	336	1	0	0	AVGAS	HI	1	4.87	NA	3900	NA
CESSNA	337	19	3	3	AVGAS	HI	1	4.87	77.19	4415	1219.5
CESSNA	340	13	8	4	AVGAS	LO	2	4.35	92.30	5990	621.9
CESSNA	401	12	3	2	AVGAS	LO	1	4.40	NA	6300	249.7
CESSNA	402	15	0	0	AVGAS	LO	2	4.62	88.40	6300	615
CESSNA	404	4	9	2	AVGAS	LO	2	4.66	118.30	8400	165
CESSNA	411	17	8	3	AVGAS	LO	1	4.40	94.90	6500	177.3
CESSNA	414	13	2	1	AVGAS	LO	2	4.40	NA	6350	337
CESSNA	414(A)	4	8	1	AVGAS	LO	2	4.72	93.6	6750	387.7
CESSNA	421(421-421B)	27	22	5	AVGAS	LO	2	4.40	NA	6840	1027.5
CESSNA	425	1	0	0	JET A	LO	2	5.04	102.70	8400	100
CESSNA	441	1	0	0	JET A	LO	2	4.73	102.70	9850	96
CESSNA	500	5	9	2	JET A	LO	2	4.68	114.40	11650	245.7
CESSNA	L-19	4	1	1	AVGAS	HI	1	NA	61.10	NA	22.3
CESSNA	T-50	1	0	0	AVGAS	HI	1	NA	48.00	NA	78.3
CESSNA/RBRTSON	206	1	0	0	AVGAS	HI	2	4.85	46.80	NA	NA
CESSNA/RBRTSON	402	1	7	1	AVGAS	LO	2	4.62	85.15	NA	NA
CESSNA/RBRTSON	414	1	12	1	AVGAS	LO	2	4.40	89.05	NA	NA
CESSNA/RILEY	421(C)	1	0	0	JET A	LO	2	4.72	92.30	7450	NA
CHAMPION	7EC	2	0	0	AVGAS	HI	1	NA	50.50	1450	NA
CONVAIR	L-13	1	0	0	AVGAS	HI	3	NA	38.00	NA	19.4
CRANE BREZY/HB	DJ-3	1	0	0	AVGAS	NA	NA	NA	NA	NA	NA
CROSSWINDS	PA-18	1	0	0	NA	NA	NA	NA	NA	NA	NA
DEHAVILLAND	DH-104	2	0	0	AVGAS	LO	NA	NA	78	NA	32.2
DEHAVILLAND	DH-82A	1	0	0	AVGAS	BI	2	NA	NA	NA	93.8
DEHAVILLAND	DHC-1	2	0	0	AVGAS	LO	2	NA	50.05	NA	87.3
DEHAVILLAND	DHC-2	7	4	1	AVGAS	HI	4	4.65	67.60	5100	255.3
DEHAVILLAND	DHC-3	5	3	2	AVGAS	HI	4	5.40	75.40	NA	22.6
DEHAVILLAND	DHC-6	1	0	0	JET A	HI	4	4.86	56.00	12039	61.9
DYKE DELTA/HB	JD-2	1	0	0	AVGAS	LO	4	NA	NA	NA	17.8
EAGLE	C-7	1	3	1	NA	NA	NA	NA	NA	NA	6
EMERAUDE	CP301	1	0	0	AVGAS	LO	2	NA	65.00	NA	13.2
ENSTROM	F-28	9	2	1	AVGAS	HELO	2	NA	N/A	2350	215.4
ERCOUPE	415	18	8	5	AVGAS	LO	2	NA	47.45?	1260	2068.7
EVANGEL	4500	1	0	0	AVGAS	LO	2	3.23	NA	NA	2.1
FAIRCHILD	24W-46	1	0	0	NA	NA	NA	NA	NA	NA	98.9

AIRCRAFT MAKE	AIRCRAFT MODEL	ACCIDENTS INVOLVING POST-IMPACT FIRES	NUMBER OF FATALITIES	NUMBER OF FATAL ACCIDENTS	FUEL TYPE	WING CONFIGU-RATION	NUMBER OF EXITS	PRIMARY EXIT DIAGONAL DIMENSION (FEET)	APPROACH SPEED (KNOTS)	GROSS WEIGHT (LBS)	AVERAGE POPULATION DURING PERIOD 1974-83
FAIRCHILD	M-62A	1	0	0	NA	NA	NA	NA	NA	NA	202.6
FOKKER	DR-1	1	0	0	NA	NA	NA	NA	NA	NA	3
FORNEY/ALON	AIRCOUPE	2	0	0	AVGAS	LO	2	NA	63.05	1425	211
GLOBE	GC-1B	3	0	0	AVGAS	LO	2	NA	42.00	1710	413
GREAT LAKES	2T-1A	3	3	2	AVGAS	BI	2	NA	65.00	NA	145
GREAT LAKES	X2T-1T	1	0	0	NA	NA	NA	NA	NA	NA	1
GRUM AMER	AA1/AA5	61	27	13	AVGAS	LO	2	NA	66.95	1560	2625.1
GRUMMAN	F8F-2	1	0	0	AVGAS	MID	1	NA	NA	NA	19.1
GRUMMAN	FM-2	1	1	1	NA	MID	NA	NA	NA	7800	17.5
GRUMMAN	G-44A	1	0	0	AVGAS	HI	1	NA	43.50	NA	82.8
GRUMMAN	G73	1	0	0	AVGAS	HI	NA	NA	NA	NA	20.1
GRUMMAN	SCAN30	1	0	0	AVGAS	HI	1	NA	88.40	NA	11.2
GULF AMER	980(695)	1	2	1	JET A	HI	2	4.50	97.5	10325	49.7
HANDLY PAGE	HP 137	2	0	0	JET A	LO	1	5.46	94.90	NA	13.7
HAWKER SDLY	SMK20	1	0	0	NA	NA	NA	NA	NA	NA	NA
HAWKER SDLY	TMK20	1	1	1	AVGAS	LO	2	NA	NA	NA	27.3
HILLER	FH1100	5	5	1	JET A	HELO	4	NA	N/A	2750	70.8
HILLER	UH-12(12-12D)	6	0	0	AVGAS	HELO	2	NA	N/A	3100	235.7
HILLER	UH-12E	9	0	0	AVGAS	HELO	2	NA	N/A	3100	231.1
HILLER	UH12L4	1	0	0	AVGAS	HELO	2	4.93	N/A	3500	17.9
HOWARD	DGA-6	1	0	0	NA	NA	NA	NA	NA	NA	NA
HUDSON	2-2-2E	1	1	1	NA	NA	NA	NA	NA	NA	NA
HUGHES	269	16	2	2	AVGAS	HELO	2	4.54	NA	NA	596.6
HUGHES	369	11	1	1	JET A	HELO	4	4.89	N/A	2825	382.4
HUGHES	500D	2	0	0	JET A	HELO	4	4.54	N/A	3000	5.3
HUNTING-PEM	MK-51	1	0	0	JET A	LO	2	NA	84.50	NA	6.2
J LOWERS	T-WIND	1	0	0	NA	NA	NA	NA	NA	NA	NA
J.A.MULLAN	DRAGONFLY	1	0	0	NA	NA	NA	NA	NA	NA	8.9
JAVELIN/HB	WICHAWK	1	2	1	AVGAS	BI	2	NA	39.00	2400	6.8
JOHNSON	CHRIS	1	0	0	NA	NA	NA	NA	NA	NA	NA
K PINSCH	MUSTNG	1	0	0	NA	NA	NA	NA	NA	NA	NA
KELEHER/HB	LARK	1	0	0	AVGAS	MID	1	NA	62.40	NA	4.4
LAKE	LA-4	1	0	0	AVGAS	HI	1	NA	59.00	2550	374.2
LEARJET	23	2	0	0	JET A	LO	2	5.41	135.20	12500	53.5
LEARJET	24	1	0	0	JET A	LO	2	4.80	117.00	12500	142.5
LOCKHEED	12A	1	0	0	NA	LO	NA	NA	NA	NA	20.7
LUSCOMBE	8A	4	0	0	AVGAS	HI	2	NA	32.00	1260	1203
MAULE	M-4	3	3	2	AVGAS	HI	3	3.72	49.22	2200	231
MAULE	M-5	4	2	1	AVGAS	HI	4	3.72	50.86	2300	166.5
MCCULLOCK	J2	1	0	0	AVGAS	AUTO GYR	2	NA	N/A	NA	34.9
MITSUBISHI	MU-2	15	15	3	JET A	HI	2	4.70	87.10	8930	409.9
MOONEY	M20	43	26	12	AVGAS	LO	2	4.01	41.50	2450	5135.8
MOONEY	M21	1	0	0	AVGAS	LO	1	4.01	65.00	2575	3.1

AIRCRAFT MAKE	AIRCRAFT MODEL	ACCIDENTS INVOLVING POST-IMPACT FIRES	NUMBER OF FATALITIES	NUMBER OF FATAL ACCIDENTS	FUEL TYPE	WING CONFIGU-RATION	NUMBER OF EXITS	PRIMARY EXIT DIAGONAL DIMENSION (FEET)	APPROACH SPEED (KNOTS)	GROSS WEIGHT (LBS)	AVERAGE POPULATION DURING PERIOD 1974-83
MUNNINGHOFF	FW-190	1	0	0	NA	NA	NA	NA	NA	NA	9.9
NAVAL FCTY	N3N	1	0	0	AVGAS	BI	NA	NA	NA	NA	158.7
NAVION	A	3	2	2	AVGAS	LO	NA	NA	74.10	2750	1313.7
NAVION	B	3	0	0	AVGAS	LO	NA	NA	74.10	2850	153.3
NAVION	L-17	1	0	0	AVGAS	LO	NA	NA	48.00	NA	16
NIEUPORT	17	1	1	1	NA	NA	NA	NA	NA	NA	1
NOORDUYN	UC64A	1	0	0	NA	NA	NA	NA	NA	NA	6.8
NORD STAMPE	SV4C	1	1	1	NA	BI	NA	NA	NA	NA	48.3
NORTH AMERICAN	AT-6/SNJ	10	5	3	AVGAS	LO	NA	NA	55.00	5300	484.6
NORTH AMERICAN	P-51	7	0	0	AVGAS	LO	1	NA	NA	NA	145.2
OLDFIELD	BABY GT/LAKES	1	0	0	AVGAS	BI	NA	NA	56.55	NA	60.3
OLDFIELD	BABY LAKES	1	1	1	AVGAS	BI	NA	NA	56.55	NA	8.9
OSPREY/HB	2	1	0	0	AVGAS	HI	2	NA	62.00	NA	18.9
OWL	OR65-2	1	1	1	AVGAS	LO	NA	NA	NA	NA	2.2
PARSONS-JOCELYN	PJ-260	1	0	0	AVGAS	BI	1	NA	59.15	NA	2.6
PILATUS	PC-6H	1	0	0	AVGAS	HI	NA	NA	NA	NA	15.4
PILATUS	PC6B1H	1	0	0	JET A	HI	NA	NA	NA	NA	NA
PILATUS	PC6CH2	1	0	0	JET A	HI	NA	NA	NA	NA	NA
PINE AIR	SUPER	1	0	0	NA	NA	NA	NA	NA	NA	1
PIPER	11	4	4	2	AVGAS	HI	NA	NA	45.50	1220	434.1
PIPER	12	13	4	3	AVGAS	HI	NA	NA	54.60	1750	1374.6
PIPER	14	3	4	3	AVGAS	HI	NA	NA	52.00	1850	105.2
PIPER	16	1	0	0	AVGAS	HI	NA	NA	56.55	1650	385.2
PIPER	17	1	0	0	AVGAS	HI	NA	NA	NA	NA	117.7
PIPER	18	42	12	9	AVGAS	HI	1	NA	48.10	1625	3047.7
PIPER	20	4	0	0	AVGAS	HI	NA	NA	53.30	1875	487.4
PIPER	22	38	8	5	AVGAS	HI	2	NA	55.08	1775	5265.9
PIPER	23	73	25	13	AVGAS	LO	2	4.20	70.90	4650	3421.1
PIPER	24	31	15	8	AVGAS	LO	1	NA	70.20	3050	3329.3
PIPER	28	199	38	24	AVGAS	LO	1	4.24	64.58	2400	19217.5
PIPER	30	12	6	1	AVGAS	LO	1	NA	78.00	3600	1212.1
PIPER	31(31,31-300)	45	21	10	AVGAS	LO	2	4.39	84.21	6350	1434.9
PIPER	31T(31T,31T2)	6	8	1	JET A	LO	2	4.06	98.15	8700	330
PIPER	32	64	30	7	AVGAS	LO	2	4.18	71.5	3400	3270.3
PIPER	34	17	5	1	AVGAS	LO	2	4.19	78.43	4750	1353
PIPER	38-112	4	2	1	AVGAS	LO	2	2.93	61.10	1670	1144
PIPER	J-3	24	8	5	AVGAS	HI	1	NA	31	1220	3818.3
PIPER	J-4	1	0	0	AVGAS	HI	2	NA	35	NA	243.9
PIPER	J-5	1	1	1	AVGAS	HI	NA	NA	35	NA	342.3
PITTS	S-1	8	1	1	AVGAS	BI	1	NA	65.00	NA	626.9
PITTS	S-2	2	0	0	AVGAS	BI	2	NA	63.00	NA	140.7
RAND ROBINSON/H	KR-1	1	0	0	AVGAS	LO	1	NA	65.91	NA	84.9
RAND ROBINSON/H	KR-2	1	0	0	AVGAS	LO	2	NA	65.91	NA	128.8
REARWIN	185	1	0	0	NA	NA	NA	NA	NA	NA	7
REPUBLIC	RC-3	2	0	0	AVGAS	HI	2	NA	46.00	3150	195.7
ROBINSON	R-22	4	0	0	AVGAS	HELO	2	NA	N/A	1300	108.8
RUTAN/HB	VARI-EZE	1	1	1	AVGAS	MID	2	NA	62.40	NA	245.4

AIRCRAFT MAKE	AIRCRAFT MODEL	ACCIDENTS INVOLVING POST-IMPACT FIRES	NUMBER OF FATALITIES	NUMBER OF FATAL ACCIDENTS	FUEL TYPE	WING CONFIGU-RATION	NUMBER OF EXITS	PRIMARY EXIT DIAGONAL DIMENSION (FEET)	APPROACH SPEED (KNOTS)	GROSS WEIGHT (LBS)	AVERAGE POPULATION DURING PERIOD 1974-83
RYAN	NAVION	4	0	0	AVGAS	LO	NA	NA	48.00	NA	NA
RYAN	ST-3KR	1	0	0	AVGAS	LO	2	NA	36.50	NA	160.9
SCORPION/HB	133	1	0	0	AVGAS	HELO	2	NA	N/A	NA	95.2
SHORTS	SC-7	1	0	0	JET A	HI	3	9.14	78.00	NA	9
SIAI-MARCHETTI	SF260	1	0	0	AVGAS	LO	3	NA	74.10	NA	6.2
SIKORSKY	S-55B	3	0	0	AVGAS	HELO	3	NA	N/A	NA	25.0
SIKORSKY	S-62A	1	0	0	JET A	HELO	1	6.40	N/A	NA	12
SIKORSKY	S58DT	1	0	0	AVGAS	HELO	2	5.26	N/A	NA	4.9
SKYHOPPER/HB?	20	1	0	0	AVGAS	LO	NA	NA	NA	NA	2.8
SMYTH/HB	MINI	2	0	0	AVGAS	BI	1	NA	62.40	NA	152.7
SMYTH/HB	SIDEWINDER	1	0	0	AVGAS	LO	2	NA	62.40	NA	24.9
SORREL/HB	SNS-2	1	0	0	AVGAS	BI	1	NA	33.80	NA	2.3
SPARTAN	7W	1	0	0	NA	HI	NA	NA	NA	NA	18.8
STARDUSTER/HB	SA-100	3	1	1	AVGAS	BI	1	NA	43.00	NA	40.6
STARDUSTER/HB	SA-300	5	1	1	AVGAS	BI	2	NA	52.00	NA	178.9
STEEN/HB	SKYBOLT	3	1	1	AVGAS	BI	2	NA	43.00	NA	131.7
STINSON	108(1-3)	16	2	1	AVGAS	HI	2	NA	44.50	2250	622.3
STINSON	JR.S.	1	2	1	NA	HI	NA	NA	NA	NA	18.7
STINSON	SR-9EM	1	0	0	NA	HI	NA	NA	NA	NA	27.6
STINSON	V-77	2	0	0	NA	HI	NA	NA	NA	NA	105.3
STITS	SA-11A	1	0	0	NA	NA	NA	NA	NA	NA	42.1
STITS	SA-3A	1	0	0	AVGAS	LO	1	NA	51.35	NA	61.3
SWEARINGEN	SA26AT	2	0	0	JET A	LO	2	5.75	97.80	12500	32.3
TAILWIND/HB	W-8	2	0	0	AVGAS	HI	2	NA	62.40	NA	113.4
TAYLORCRAFT	BC12-D	2	0	0	AVGAS	HI	2	NA	35.00	1500	1508.7
TAYLORCRAFT	BF12-D	1	0	0	AVGAS	HI	NA	NA	NA	NA	25
TAYLORCRAFT	DC0-65	1	0	0	AVGAS	HI	2	NA	44.50	NA	264.3
THORP/HB	T-18	8	2	1	AVGAS	LO	1	NA	74.10	1500	176.7
TURNER/HB	T-40A	1	0	0	AVGAS	LO	2	NA	61.10	NA	16.9
VAN'S/HB	RV-3	1	1	1	AVGAS	LO	1	NA	54.60	NA	45.2
VANHOOSE/SCORPI	EXECUTIVE	1	0	0	AVGAS	NA	NA	NA	NA	NA	NA
VARGA	2150A	1	0	0	AVGAS	LO	2	NA	58.50	1817	60
VOLMER/HB	SPORTSMAN	1	0	0	AVGAS	GLIDER	NA	NA	NA	NA	40.5
WACO	UPF-7	2	0	0	AVGAS	BI	2	NA	NA	NA	157.8
WILDMASTER	2	1	0	0	NA	NA	NA	NA	NA	NA	NA
WILLIE	II	1	0	0	AVGAS	BI	2	NA	68.00	NA	2.1
WREN	182	2	0	0	AVGAS	HI	2	4.46	35.10	NA	NA
		2351	798	378							

APPENDIX B

INFLIGHT FIRE DATA FOR SINGLE-ENGINE GENERAL AVIATION AIRCRAFT (1979-1983)

APPENDIX B. INFLIGHT FIRE DATA FOR SINGLE ENGINE GENERAL AVIATION AIRCRAFT (1979-1983)

Aircraft Type	Location of On-board Fire	Origin of Onboard Fire	Cause of Fire	Relative Damage to Aircraft	Number of Fatal-ities	Number of In-juries
BEECH 35	CABIN	UNKNOWN	UNKNOWN	PI DESTROY*	0	3
BEECH 36	ENGINE	UNKNOWN	UNKNOWN	PI DESTROY	1	3
BELL 206L	EMGINE	POWERPLANT	ENGINE FAILURE	PI DESTROY	2	0
CESSNA 206	INSTRUMENT PANEL	ELECTRICAL SYSTEM	ELECTRICAL FAILURE	PI DESTROY	0	1
CESSNA 172	INSTRUMENT PANEL	ELECTRICAL SYSTEM	ELECTRICAL FAILURE	DAMAGED	0	0
CESSNA 182	ENGINE	UNKNOWN	UNKNOWN	UNKNOWN	1	0
CESSNA 172	CABIN	UNKNOWN	UNKNOWN	PI DESTROY	1	0
CESSNA 207	ENGINE	POWERPLANT	ENGINE FAILED/BROKE FUEL LINE	DAMAGED	0	0
CESSNA 150	CABIN	PASSENGER	FLARE GUN DISCHARGED IN CABIN INFLIGHT	PI DESTROY	0	2
CESSNA 182	BAGGAGE COMPARTMENT	ELECTRICAL SYSTEM	BATTERY/ELECTRICAL FAILURE	PI DESTROY	0	0
CESSNA 206	ENGINE	ELECTRICAL SYSTEM	ALTERNATOR FAILURE	PI DESTROY	0	0
CESSNA 182	ENGINE	POWERPLANT	CARBURETOR FAILURE	DAMAGED	0	0
CESSNA 210	ENGINE	ELECTRICAL SYSTEM	ELECTRICAL SHORT IGNITED FUEL	PI DESTROY	2	0
CESSNA 182	ENGINE	FUEL SYSTEM	FUEL SYSTEM FAILURE	DAMAGED	0	0
CESSNA 210	ENGINE	POWERPLANT	ENGINE FAILURE	DAMAGED	0	0
CESSNA 206	ENGINE	UNKNOWN	UNKNOWN	PI DESTROY	0	1
CESSNA 210	ENGINE	POWERPLANT	ENGINE FAILURE	PI DESTROY	0	0
CESSNA 180	ENGINE	UNKNOWN	UNKNOWN	PI DESTROY	0	1
CESSNA 210	INSTRUMENT PANEL	ELECTRICAL SYSTEM	ELECTRICAL FAILURE	DAMAGED	0	1
CESSNA 150	INSTRUMENT PANEL	ELECTRICAL SYSTEM	ELECTRICAL FAILURE	PI DESTROY	0	2
CESSNA 172	ENGINE	UNKNOWN	UNKNOWN	PI DESTROY	0	0
ERCOUPE 415	ENGINE	POWERPLANT	CARBURETOR FUEL LEAK	PI DESTROY	0	1
ERCOUPE F-1	INSTRUMENT PANEL	ELECTRICAL SYSTEM	ELECTRICAL SHORT	DMAMGED	0	1
GRUMMAN 6164A	ENGINE	FUEL SYSTEM	FUEL LINE FAILURE	DAMAGED	0	0
HOMEBUILT MUSTANG 2	UNKNOWN	UNKNOWN	UNKNOWN	UNKNOWN	0	0
HUGHES 369	CABIN	UNKNOWN	UNKNOWN	PI DESTROY	0	0
HUGHES 269	RIGHT FUSELAGE	POWERPLANT	EXHAUST IGNITED LUGGAGE	DAMAGED	0	0
HUGHES 269	ENGINE	UNKNOWN	UNKNOWN	PI DESTROY	0	0
MAULE M-5	ENGINE	POWERPLANT	ENGINE FAILURE CAUSED OIL LEAK	DAMAGED	0	1
MOONEY M20	INSTRUMENT PANEL	UNKNOWN	UNKNOWN	DAMAGED	0	1
MOONEY M20	ENGINE	POWERPLANT	EXHAUST IGNITED OIL LEAK	DAMAGED	0	0
NAVION A	CABIN	FUEL SYSTEM	FUEL LINE FAILURE	DAMAGED	2	0
NAVION B	ENGINE	POWERPLANT	OIL SYSTEM FAILURE	PI DESTROY	1	0
PIPER 32	ENGINE	POWERPLANT	ENGINE CYLINDER FAILURE	DAMAGED	0	0
PIPER 28	BATTERY COMPARTMENT	ELECTRICAL SYSTEM	BATTERY LOOSE AND SHORTED	DAMAGED	0	0
PIPER 32	ENGINE	UNKNOWN	UNKNOWN	DAMAGED	0	2
PIPER 28	UNKNOWN	UNKNOWN	UNKNOWN	PI DESTROY	0	1
PIPER 22	INSTRUMENT PANEL	ELECTRICAL SYSTEM	ELECTRICAL SHORT	DAMAGED	4	2
PIPER 18	ENGINE	ELECTRICAL SYSTEM	ELECTRICAL STARTER FAILURE	PI DESTROY	0	0
PIPER 28	CABIN	ELECTRICAL SYSTEM	BATTERY SHORTED BELOW REAR SEAT	PI DESTROY	2	2

*PI DESTROY = Destroyed after touchdown.

APPENDIX C.

INFLIGHT FIRE DATA FOR TWIN-ENGINE GENERAL AVIATION AIARCRAFT (1979-1983)

APPENDIX C. INFLIGHT FIRE DATA FOR TWIN ENGINE GENERAL AVIATION AIRCRAFT (1979-1983)

Aircraft Type	Location of On-board Fire	Origin of Onboard Fire	Cause of Fire	Relative Damage to Aircraft	Number of Fatal-ities	Number of In-juries
AERO COMMANDER 680	ENGINE	UNKNOWN	UNKNOWN	DAMAGED	1	0
AERO COMMANDER 560	REAR BAGGAGE COMPARTMENT	ELECTRICAL SYSTEM	ELECTRICAL FAILURE	PI DESTROY	0	1
AEROSTAR 601P	RIGHT ENGINE	POWERPLANT	EXHAUST FAILURE	PI DESTROY	3	0
AEROSTAR 601	LEFT ENGINE	POWERPLANT	OIL LINE FAILURE	DAMAGED	0	0
BEECH 65	RIGHT ENGINE	POWERPLANT	TURBOCHARGER FAILURE	DAMAGED	0	0
BEECH 55	LEFT FORWARD CABIN	ELECTRICAL SYSTEM	ELEC WIRES IGNITED FUEL LINE BELOW SEAT	PI DESTROY	0	0
BEECH 65	LEFT ENGINE	POWERPLANT	EXHAUST IGNITED FUEL	LT NACELLE	0	0
BEECH 95	LEFT ENGINE	FUEL SYSTEM	FUEL LINE LEAK	EXPL ON IMPACT	4	0
BEECH 55	LEFT WHEEL WELL	POWERPLANT	FUEL PUMP FAILURE	PI DESTROY	3	0
BEECH 80	LEFT ENGINE	FUEL SYSTEM	FUEL LINE FAILURE	PI DESTROY	1	0
BEECH 18	LEFT WING	HEATER	HEATER FAILURE INGITED WHEEL WELL	PI DESTROY	4	0
BEECH 58	RIGHT ENGINE	ELECTRICAL SYSTEM	VOLTAGE REGULATOR FAILED	DAMAGED	0	0
BEECH 18	LEFT ENGINE	POWERPLANT	OIL LEAK	PI DESTOY	1	0
CESSNA 401	RIGHT ENGINE	FUEL SYSTEM	FAIL OF UNAPPROVED FUEL SYSTEM MODIF.	DAMAGED	0	0
CESSNA 404	LEFT ENGINE	POWERPLANT	EXHAUST FAILURE IGNITED ELEC. WIRING	DAMAGED	0	0
CESSNA 310	LEFT WING	ELECTRICAL SYSTEM	ELECTR. WIRES IGNITED FUEL BLADDER LEAK	DAMAGED	0	0
CESSNA 402	LEFT ENGINE	POWERPLANT	EXHAUST FAILURE	PI DESTROY	0	0
CESSNA 421	LEFT ENGINE	POWERPLANT	EXHAUST FAILURE	DAMAGED	0	0
CESSNA 320	RIGHT ENGINE	POWERPLANT	EXHAUST FAILURE	DAMAGED	0	0
CESSNA 402	LEFT ENGINE	FUEL SYSTEM	FUEL LINE LEAK	DAMAGED	0	0
CESSNA 310	CABIN	ELECTRICAL SYSTEM	ELECTRICAL FAILURE	PI DESTROY	0	0
CESSNA 401	RIGHT ENGINE	POWERPLANT	EXHAUST FAILURE	DAMAGED	0	0
CESSNA 320	LEFT ENGINE	POWERPLANT	EXHAUST FAILURE	DAMAGED	0	0
CESSNA 337	UNNKNOWN	UNKNOWN	REAR CABIN OR ENGINE SOURCE	UNKNOWN	0	0
CESSNA 402	RIGHT ENGINE	POWERPLANT	OIL LEAK	PI DESTROY	0	1
PIPER 30	LEFT ENGINE	UNKNOWN	UNKNOWN	DAMAGED	0	0
PIPER 23	RIGHT ENGINE	POWERPLANT	OIL LINE LEAK	DAMAGED	2	0
PIPER 31	RIGHT ENGINE	FUEL SYSTEM	FUEL LINE FAILURE	DAMAGED	0	0
PIPER 31	LEFT ENGINE	POWERPLANT	OIL FILLER CAP LEFT OFF	PI DESTROY	0	0
PIPER 23	RIGHT ENGINE	UNKNOWN	UNKNOWN	UNKNOWN	0	0

PI= Destroyed after touchdown.

APPENDIX D

SUMMARY OF AIRCRAFT POPULATIONS AND ACCIDENTS INVOLVING POST-IMPACT FIRES, GENERAL AVIATION AIRCRAFT WITH POST-IMPACT FIRES, POPULATION > 10, 1974-1983

APPENDIX D. SUMMARY OF AIRCRAFT POPULATIONS AND ACCIDENTS INVOLVING POST-IMPACT FIRES, GENERAL AVIATION AIRCRAFT WITH POST-IMPACT FIRES, POPULATION >10, 1974-1983

Aircraft make COL. A.	Aircraft model Col. B	Average population during period 1974-83 Col. C	Number Accidents involving post-impact fires Col. D	Aircraft's population as portion of GA ave. total a/c population (C/230552) Col. E	Aircraft's Fire Accidents as portion of Total GA Accidents (D/36130) Col. F
AERO COMDR	112	463.7	4	0.2011%	0.0111%
AERO COMDR	114	253.0	2	0.1097%	0.0055%
AERO COMDR	200-D	66.0	1	0.0286%	0.0028%
AERO COMDR	500	348.6	4	0.1512%	0.0111%
AERO COMDR	520	65.0	2	0.0282%	0.0055%
AERO COMDR	560	171.4	7	0.0743%	0.0194%
AERO COMDR	680	348.6	17	0.1512%	0.0471%
AERO COMDR	690	39.0	5	0.0169%	0.0138%
AERONCA	11AC	741.0	4	0.3214%	0.0111%
AERONCA	15AC	691.3	1	0.2998%	0.0028%
AERONCA	65-TAL	136.7	1	0.0593%	0.0028%
AERONCA	7AC	2186.0	7	0.9482%	0.0194%
AERONCA	7BCM	209.7	3	0.0910%	0.0083%
AERONCA	7DC	149.0	1	0.0646%	0.0028%
AEROSPATIALE	315B	51.9	7	0.0225%	0.0194%
AEROSPATIALE	341G	48.4	1	0.0210%	0.0028%
AEROSPATIALE	360C	11.1	1	0.0048%	0.0028%
AEROSTAR	601P	364.3	12	0.1580%	0.0332%
AEROSTAR	600	199.3	4	0.0864%	0.0111%
AEROSTAR	601	123.3	2	0.0535%	0.0055%
BEDE	BD4	139.9	4	0.0607%	0.0111%
BEDE	BD5A	56.4	2	0.0245%	0.0055%
BEDE	BD5B	51.0	2	0.0221%	0.0055%
BEECH	D-17S	124.0	1	0.0538%	0.0028%
BEECH	T34	52.3	7	0.0227%	0.0194%
BEECH	19(B19)	315.0	10	0.1366%	0.0277%
BEECH	24(23R)	562.7	14	0.2441%	0.0387%
BEECH	56TC	61.0	1	0.0265%	0.0028%
BEECH	58P	336.3	6	0.1459%	0.0166%
BEECH	58TC	103.7	3	0.0450%	0.0083%
BEECH	76/77	341.7	3	0.1482%	0.0083%
BEECH	18	815.3	80	0.3536%	0.2214%
BEECH	19	249.3	7	0.1081%	0.0194%
BEECH	23	1716.0	23	0.7443%	0.0637%
BEECH	33	1511.8	14	0.6557%	0.0387%
BEECH	35	6882.6	79	2.9853%	0.2187%
BEECH	36	1165.1	19	0.5054%	0.0526%
BEECH	50	346.1	5	0.1501%	0.0138%

Make	Model	Population	Fire Accidents	Population %	Fire %
BEECH	55	2245.7	43	0.9741%	0.1190%
BEECH	58	919.0	11	0.3986%	0.0304%
BEECH	60	85.7	11	0.0372%	0.0304%
BEECH	65	107.7	16	0.0467%	0.0443%
BEECH	90	956.3	13	0.4148%	0.0360%
BEECH	95	309.0	9	0.1340%	0.0249%
BEECH	99	39.8	3	0.0173%	0.0083%
BEECH	100	155.3	3	0.0674%	0.0083%
BEECH	200	591.0	3	0.2563%	0.0083%
BELL	205A	48.0	3	0.0208%	0.0083%
BELL	476	961.5	55	0.4170%	0.1522%
BELL	47J	91.7	14	0.0398%	0.0387%
BELL	206	258.0	23	0.1119%	0.0637%
BELL	222	24.7	1	0.0107%	0.0028%
BELLANCA	17(30,31)	201.3	7	0.0873%	0.0194%
BELLANCA	17(30A,31A)	727.7	8	0.3156%	0.0221%
BELLANCA	1413	245.7	6	0.1066%	0.0166%
BELLANCA	1419	1539.9	3	0.6679%	0.0083%
BELNCA/CHAMP	7ECA	940.3	5	0.4078%	0.0138%
BELNCA/CHAMP	76C	512.7	4	0.2224%	0.0111%
BELNCA/CHAMP	76CAA	153.8	2	0.0667%	0.0055%
BELNCA/CHAMP	76CB	53.3	2	0.0231%	0.0055%
BELNCA/CHAMP	76CBC	537.2	15	0.2330%	0.0415%
BELNCA/CHAMP	7KCAB	327.0	11	0.1418%	0.0304%
BELNCA/CHAMP	86CBC	216.0	10	0.0937%	0.0277%
BOLKOW	BO-105	58.1	1	0.0252%	0.0028%
BRANTLY	B-2	51.7	3	0.0224%	0.0083%
BRANTLY	305	14.4	2	0.0062%	0.0055%
BREEZY/HB	I	73.5	1	0.0319%	0.0028%
BUSHBY/HB	MM-II	58.8	1	0.0255%	0.0028%
BUSHBY/HB	MM-I	71.7	2	0.0311%	0.0055%
CESSNA	L-19	22.3	4	0.0097%	0.0111%
CESSNA	T-50	78.3	1	0.0340%	0.0028%
CESSNA	414(A)	387.7	4	0.1682%	0.0111%
CESSNA	120	917.1	4	0.3978%	0.0111%
CESSNA	140	2481.6	5	1.0764%	0.0138%
CESSNA	150	17682.6	95	7.6697%	0.2629%
CESSNA	170	2578.2	17	1.1183%	0.0471%
CESSNA	172	21288.7	88	9.2338%	0.2436%
CESSNA	175	1410.5	6	0.6118%	0.0166%
CESSNA	177	2737.7	26	1.1875%	0.0720%
CESSNA	180	2603.3	13	1.1292%	0.0360%
CESSNA	182	3150.4	90	1.3665%	0.2491%
CESSNA	185	1200.5	18	0.5207%	0.0498%
CESSNA	195	468.6	7	0.2033%	0.0194%
CESSNA	205	258.0	1	0.1119%	0.0028%
CESSNA	206	2352.5	22	1.0204%	0.0609%

Make	Model	Population	Fire Accidents	Population %	Fire %
CESSNA	207	246.3	12	0.1068%	0.0332%
CESSNA	210	4754.4	62	2.0622%	0.1716%
CESSNA	310	2978.3	55	1.2918%	0.1522%
CESSNA	320	353.8	14	0.1535%	0.0387%
CESSNA	337	1219.5	19	0.5289%	0.0526%
CESSNA	340	621.9	13	0.2697%	0.0360%
CESSNA	401	249.7	12	0.1083%	0.0332%
CESSNA	402	615.0	15	0.2668%	0.0415%
CESSNA	404	165.0	4	0.0716%	0.0111%
CESSNA	411	177.3	17	0.0769%	0.0471%
CESSNA	414	337.0	13	0.1462%	0.0360%
CESSNA	421	1027.5	27	0.4457%	0.0747%
CESSNA	425	100.0	1	0.0434%	0.0028%
CESSNA	441	96.0	1	0.0416%	0.0028%
CESSNA	500	245.7	5	0.1066%	0.0138%
CONVAIR	L-13	19.4	1	0.0084%	0.0028%
DEHAVILLAND	DH-104	32.2	2	0.0140%	0.0055%
DEHAVILLAND	DH-82A	93.8	1	0.0407%	0.0028%
DEHAVILLAND	DHC-1	87.3	2	0.0379%	0.0055%
DEHAVILLAND	DHC-2	255.3	7	0.1107%	0.0194%
DEHAVILLAND	DHC-3	22.6	5	0.0098%	0.0138%
DEHAVILLAND	DHC-6	61.9	1	0.0268%	0.0028%
DYKE DELTA/HB	JD-2	17.8	1	0.0077%	0.0028%
EMERAUDE	CP301	13.2	1	0.0057%	0.0028%
ENSTROM	F-28	215.4	9	0.0934%	0.0249%
ERCOUPE	415	2068.7	18	0.8973%	0.0498%
FAIRCHILD	M-62A	202.6	1	0.0879%	0.0028%
FAIRCHILD	24W-46	98.9	1	0.0429%	0.0028%
FORNEY/ALON	AIRCOUPE	211.0	2	0.0915%	0.0055%
GLOBE	GC-1B	413.0	3	0.1791%	0.0083%
GREAT LAKES	2T-1A	145.0	3	0.0629%	0.0083%
GRUM AMER	AA1/AA5	2625.1	61	1.1386%	0.1688%
GRUMMAN	FM-2	17.5	1	0.0076%	0.0028%
GRUMMAN	F8F-2	19.1	1	0.0083%	0.0028%
GRUMMAN	G-44A	82.8	1	0.0359%	0.0028%
GRUMMAN	G73	20.1	1	0.0087%	0.0028%
GRUMMAN	SCAN30	11.2	1	0.0049%	0.0028%
GULF AMER	980(695)	49.7	1	0.0216%	0.0028%
HANDLY PAGE	HP	13.7	2	0.0059%	0.0055%
HAWKER SDLY	TMK20	27.3	1	0.0118%	0.0028%
HILLER	FH1100	70.8	5	0.0307%	0.0138%
HILLER	UH-12(12-12D	235.7	6	0.1022%	0.0166%
HILLER	UH-12E	231.1	9	0.1002%	0.0249%
HILLER	UH12L4	17.9	1	0.0078%	0.0028%
HUGHES	269	596.6	16	0.2588%	0.0443%
HUGHES	369	382.4	11	0.1659%	0.0304%
LAKE	LA-4	374.2	1	0.1623%	0.0028%

Make	Model	Population	Fire Accidents	Population %	Fire %
LEARJET	23	53.5	2	0.0232%	0.0055%
LEARJET	24	142.5	1	0.0618%	0.0028%
LOCKHEED	12A	20.7	1	0.0090%	0.0028%
LUSCOMBE	8A	1203.0	4	0.5218%	0.0111%
MAULE	M-4	231.0	3	0.1002%	0.0083%
MAULE	M-5	166.5	4	0.0722%	0.0111%
MCCULLOCK	J2	34.9	1	0.0151%	0.0028%
MITSUBISHI	MU2	409.9	15	0.1778%	0.0415%
MOONEY	M20	5135.8	43	2.2276%	0.1190%
NAVAL FCTY	N3N	158.7	1	0.0688%	0.0028%
NAVION	A	1313.7	3	0.5698%	0.0083%
NAVION	B	153.3	3	0.0665%	0.0083%
NAVION	L-17	16.0	1	0.0069%	0.0028%
NORD STAMPE	SV4C	48.3	1	0.0209%	0.0028%
NORTH AMERICAN	AT-6/SNJ	484.6	10	0.2102%	0.0277%
NORTH AMERICAN	P-51	145.2	7	0.0630%	0.0194%
OLDFIELD	BABY GT/LAKE	60.3	1	0.0262%	0.0028%
OSPREY/HB	2	18.9	1	0.0082%	0.0028%
PILATUS	PC6-H	15.4	1	0.0067%	0.0028%
PIPER	J-3	3818.3	24	1.6562%	0.0664%
PIPER	J-4	243.9	1	0.1058%	0.0028%
PIPER	J-5	342.3	1	0.1485%	0.0028%
PIPER	31T	330.0	6	0.1431%	0.0166%
PIPER	38-112	1144.0	4	0.4962%	0.0111%
PIPER	11	434.1	4	0.1883%	0.0111%
PIPER	12	1374.6	13	0.5962%	0.0360%
PIPER	14	105.2	3	0.0456%	0.0083%
PIPER	16	385.2	1	0.1671%	0.0028%
PIPER	17	117.7	1	0.0511%	0.0028%
PIPER	18	3047.7	42	1.3219%	0.1162%
PIPER	20	487.4	4	0.2114%	0.0111%
PIPER	22	5265.9	38	2.2840%	0.1052%
PIPER	23	3421.1	73	1.4839%	0.2020%
PIPER	24	3329.3	31	1.4441%	0.0858%
PIPER	28	19217.5	199	8.3354%	0.5508%
PIPER	30	1212.1	12	0.5257%	0.0332%
PIPER	31	1434.9	45	0.6224%	0.1246%
PIPER	32	3270.3	64	1.4185%	0.1771%
PIPER	34	1353.0	17	0.5869%	0.0471%
PITTS	S-1	626.9	8	0.2719%	0.0221%
PITTS	S-2	140.7	2	0.0610%	0.0055%
RAND ROBINSON/	KR-1	84.9	1	0.0368%	0.0028%
RAND ROBINSON/	KR-2	128.8	1	0.0559%	0.0028%
REPUBLIC	RC-3	195.7	2	0.0849%	0.0055%
ROBINSON	R-22	108.8	4	0.0472%	0.0111%
RUTAN/HB	VARI-EZE	245.4	1	0.1064%	0.0028%
RYAN	ST-3KR	160.9	1	0.0698%	0.0028%

APPENDIX E

SUMMARY OF AIRCRAFT POPULATIONS AND ACCIDENTS INVOLVING POST-IMPACT FIRES, SHOWING RATIONS BASED ON THIS GROUP'S TOTAL POPULATION AND FIRE ACCIDENTS

APPENDIX E. SUMMARY OF AIRCRAFT POPULATIONS AND ACCIDENTS INVOLVING POST-IMPACT FIRES, SHOWING RATIOS BASED ON THIS GROUP'S TOTAL POPULATION AND FIRE ACCIDENTS

Aircraft make	Aircraft model	Average population during period 1974-83	Accidents involving post-impact fires	Aircraft's population as portion of this Group's population C/181462	Aircraft's Fire accidents as portion of this Group's accidents D/2275	Difference Col.E-Col.F
Col. A	Col. B	Col. C	Col. D	Col. E	Col. F	Col. G
BEECH	18	815.3	80	0.4493%	3.5165%	-3.067%
CESSNA	182	3150.4	90	1.7361%	3.9560%	-2.220%
BELL	47G	961.5	55	0.5299%	2.4176%	-1.888%
PIPER	23	3421.1	73	1.8853%	3.2088%	-1.323%
GRUM AMER	AA1/AA5	2625.1	61	1.4466%	2.6813%	-1.235%
PIPER	31	1434.9	45	0.7907%	1.9780%	-1.187%
PIPER	32	3270.3	64	1.8022%	2.8132%	-1.011%
BELL	206	258.0	23	0.1422%	1.0110%	-0.869%
CESSNA	310	2978.3	55	1.6413%	2.4176%	-0.776%
BEECH	55	2245.7	43	1.2376%	1.8901%	-0.653%
CESSNA	411	177.3	17	0.0977%	0.7473%	-0.650%
BEECH	65	107.7	16	0.0594%	0.7033%	-0.644%
CESSNA	421	1027.5	27	0.5662%	1.1868%	-0.621%
BELL	47J	91.7	14	0.0505%	0.6154%	-0.565%
AERO COMDR	680	348.6	17	0.1921%	0.7473%	-0.555%
MITSUBISHI	MU2	409.9	15	0.2259%	0.6593%	-0.433%
BEECH	60	85.7	11	0.0472%	0.4835%	-0.436%
CESSNA	320	353.8	14	0.1950%	0.6154%	-0.420%
CESSNA	207	246.3	12	0.1357%	0.5275%	-0.392%
CESSNA	401	249.7	12	0.1376%	0.5275%	-0.390%
CESSNA	414	337.0	13	0.1857%	0.5714%	-0.386%
HUGHES	269	596.6	16	0.3288%	0.7033%	-0.375%
BELNCA/CHAMP	7GCBC	537.2	15	0.2960%	0.6593%	-0.363%
STINSON	108(1-3)	622.3	16	0.3429%	0.7033%	-0.360%
AEROSTAR	601P	364.3	12	0.2008%	0.5275%	-0.327%
BELNCA/CHAMP	8GCBC	216.0	10	0.1190%	0.4396%	-0.321%
CESSNA	402	615.0	15	0.3389%	0.6593%	-0.320%
BEECH	24(23R)	562.7	14	0.3101%	0.6154%	-0.305%
BELNCA/CHAMP	7KCAB	327.0	11	0.1802%	0.4835%	-0.303%
AEROSPATIALE	315B	51.9	7	0.0286%	0.3077%	-0.279%
BEECH	T34	52.3	7	0.0288%	0.3077%	-0.279%
ENSTROM	F-28	215.4	9	0.1187%	0.3956%	-0.277%
HUGHES	369	382.4	11	0.2107%	0.4835%	-0.273%
HILLER	UH-12E	231.1	9	0.1274%	0.3956%	-0.268%
BEECH	19(B19)	315.0	10	0.1736%	0.4396%	-0.266%
THORP/HB	T-18	176.7	8	0.0974%	0.3516%	-0.254%

Make	Model	Population	Fire Accidents	Population %	Fire %	Difference
CESSNA	340	621.9	13	0.3427%	0.5714%	-0.229%
NORTH AMERICAN	P-51	145.2	7	0.0800%	0.3077%	-0.228%
BEECH	95	309.0	9	0.1703%	0.3956%	-0.225%
AERO COMDR	560	171.4	7	0.0945%	0.3077%	-0.213%
DEHAVILLAND	DHC-3	22.6	5	0.0125%	0.2198%	-0.207%
AERO COMDR	690	39.0	5	0.0215%	0.2198%	-0.198%
BELLANCA	17(30,31)	201.3	7	0.1109%	0.3077%	-0.197%
BEECH	36	1165.1	19	0.6421%	0.8352%	-0.193%
HILLER	FH1100	70.8	5	0.0390%	0.2198%	-0.181%
NORTH AMERICAN	AT-6/SNJ	484.6	10	0.2671%	0.4396%	-0.173%
BEECH	19	249.3	7	0.1374%	0.3077%	-0.170%
DEHAVILLAND	DHC-2	255.3	7	0.1407%	0.3077%	-0.167%
PIPER	18	3047.7	42	1.6795%	1.8462%	-0.167%
CESSNA	L-19	22.3	4	0.0123%	0.1758%	-0.164%
CESSNA	337	1219.5	19	0.6720%	0.8352%	-0.163%
HILLER	UH-12(12-12D	235.7	6	0.1299%	0.2637%	-0.134%
CESSNA	185	1200.5	18	0.6616%	0.7912%	-0.130%
BELLANCA	1413	245.7	6	0.1354%	0.2637%	-0.128%
STARDUSTER/HB	SA-300	178.9	5	0.0986%	0.2198%	-0.121%
SIKORSKY	S-55B	24.9	3	0.0137%	0.1319%	-0.118%
ROBINSON	R-22	108.8	4	0.0600%	0.1758%	-0.116%
BEECH	99	39.8	3	0.0219%	0.1319%	-0.110%
STARDUSTER/HB	SA-100	40.6	3	0.0224%	0.1319%	-0.109%
BELL	205A	48.0	3	0.0265%	0.1319%	-0.105%
CESSNA	210	4754.4	62	2.6201%	2.7253%	-0.105%
BRANTLY	B-2	51.7	3	0.0285%	0.1319%	-0.103%
BEDE	BD4	139.9	4	0.0771%	0.1758%	-0.099%
CESSNA	404	165.0	4	0.0909%	0.1758%	-0.085%
CESSNA	500	245.7	5	0.1354%	0.2198%	-0.084%
MAULE	M-5	166.5	4	0.0918%	0.1758%	-0.084%
PIPER	31T	330.0	6	0.1819%	0.2637%	-0.082%
HANDLY PAGE	HP	13.7	2	0.0075%	0.0879%	-0.080%
BRANTLY	305	14.4	2	0.0079%	0.0879%	-0.080%
BEECH	58P	336.3	6	0.1853%	0.2637%	-0.078%
BEECH	58TC	103.7	3	0.0571%	0.1319%	-0.075%
PIPER	14	105.2	3	0.0580%	0.1319%	-0.074%
DEHAVILLAND	DH-104	32.2	2	0.0177%	0.0879%	-0.070%
SWEARINGEN	SA26AT	32.3	2	0.0178%	0.0879%	-0.070%
AEROSTAR	600	199.3	4	0.1098%	0.1758%	-0.066%
BEECH	23	1716.0	23	0.9457%	1.0110%	-0.065%
BEDE	BD5B	51.0	2	0.0281%	0.0879%	-0.060%
STEEN/HB	SKYBOLT	131.7	3	0.0726%	0.1319%	-0.059%
BELNCA/CHAMP	7GCB	53.3	2	0.0294%	0.0879%	-0.059%
LEARJET	23	53.5	2	0.0295%	0.0879%	-0.058%
BEDE	BD5A	56.4	2	0.0311%	0.0879%	-0.057%
AERO COMDR	520	65.0	2	0.0358%	0.0879%	-0.052%
GREAT LAKES	2T-1A	145.0	3	0.0799%	0.1319%	-0.052%

Make	Model	Population	Fire Accidents	Population %	Fire %	Difference
CESSNA	195	468.6	7	0.2582%	0.3077%	-0.049%
BUSHBY/HB	MM-I	71.7	2	0.0395%	0.0879%	-0.048%
NAVION	B	153.3	3	0.0845%	0.1319%	-0.047%
BEECH	100	155.3	3	0.0856%	0.1319%	-0.046%
BEECH	90	956.3	13	0.5270%	0.5714%	-0.044%
DEHAVILLAND	DHC-1	87.3	2	0.0481%	0.0879%	-0.040%
AEROSPATIALE	360C	11.1	1	0.0061%	0.0440%	-0.038%
GRUMMAN	SCAN30	11.2	1	0.0062%	0.0440%	-0.038%
EMERAUDE	CP301	13.2	1	0.0073%	0.0440%	-0.037%
PILATUS	PC6-H	15.4	1	0.0085%	0.0440%	-0.035%
NAVION	L-17	16.0	1	0.0088%	0.0440%	-0.035%
TURNER/HB	T-40A	16.9	1	0.0093%	0.0440%	-0.035%
GRUMMAN	FM-2	17.5	1	0.0096%	0.0440%	-0.034%
DYKE DELTA/HB	JD-2	17.8	1	0.0098%	0.0440%	-0.034%
HILLER	UH12L4	17.9	1	0.0099%	0.0440%	-0.034%
STINSON	JR.S.	18.7	1	0.0103%	0.0440%	-0.034%
SPARTAN	7W	18.8	1	0.0104%	0.0440%	-0.034%
OSPREY/HB	2	18.9	1	0.0104%	0.0440%	-0.034%
GRUMMAN	F8F-2	19.1	1	0.0105%	0.0440%	-0.033%
CONVAIR	L-13	19.4	1	0.0107%	0.0440%	-0.033%
GRUMMAN	G73	20.1	1	0.0111%	0.0440%	-0.033%
LOCKHEED	12A	20.7	1	0.0114%	0.0440%	-0.033%
BELL	222	24.7	1	0.0136%	0.0440%	-0.030%
SMYTH/HB	SIDEWINDER	24.9	1	0.0137%	0.0440%	-0.030%
SIKORSKY	S-62A	25.0	1	0.0138%	0.0440%	-0.030%
TAYLORCRAFT	BF12-D	25.0	1	0.0138%	0.0440%	-0.030%
STINSON	V-77	105.3	2	0.0580%	0.0879%	-0.030%
BEECH	50	346.1	5	0.1907%	0.2198%	-0.029%
HAWKER SDLY	TMK20	27.3	1	0.0150%	0.0440%	-0.029%
STINSON	SR-9EM	27.6	1	0.0152%	0.0440%	-0.029%
TAILWIND/HB	W-8	113.4	2	0.0625%	0.0879%	-0.025%
MCCULLOCK	J2	34.9	1	0.0192%	0.0440%	-0.025%
VOLMER/HB	SPORTSMAN	40.5	1	0.0223%	0.0440%	-0.022%
STITS	SA-11A	42.1	1	0.0232%	0.0440%	-0.021%
AEROSTAR	601	123.3	2	0.0679%	0.0879%	-0.020%
VAN'S/HB	RV-3	45.2	1	0.0249%	0.0440%	-0.019%
NORD STAMPE	SV4C	48.3	1	0.0266%	0.0440%	-0.017%
AEROSPATIALE	341G	48.4	1	0.0267%	0.0440%	-0.017%
GULF AMER	980(695)	49.7	1	0.0274%	0.0440%	-0.017%
AERONCA	7BCM	209.7	3	0.1156%	0.1319%	-0.016%
BOLKOW	BO-105	58.1	1	0.0320%	0.0440%	-0.012%
BUSHBY/HB	MM-II	58.8	1	0.0324%	0.0440%	-0.012%
VARGA	2150A	60.0	1	0.0331%	0.0440%	-0.011%
OLDFIELD	BABY GT/LAKE	60.3	1	0.0332%	0.0440%	-0.011%
PITTS	S-2	140.7	2	0.0775%	0.0879%	-0.010%
BEECH	56TC	61.0	1	0.0336%	0.0440%	-0.010%
STITS	SA-3A	61.3	1	0.0338%	0.0440%	-0.010%

Make	Model	Population	Fire Accidents	Population %	Fire %	Difference
DEHAVILLAND	DHC-6	61.9	1	0.0341%	0.0440%	-0.010%
AERO COMDR	200-D	66.0	1	0.0364%	0.0440%	-0.008%
PITTS	S-1	626.9	8	0.3455%	0.3516%	-0.006%
MAULE	M-4	231.0	3	0.1273%	0.1319%	-0.005%
SMYTH/HB	MINI	152.7	2	0.0841%	0.0879%	-0.004%
BREEZY/HB	I	73.5	1	0.0405%	0.0440%	-0.003%
BELNCA/CHAMP	7GCAA	153.8	2	0.0848%	0.0879%	-0.003%
PIPER	34	1353.0	17	0.7456%	0.7473%	-0.002%
WACO	UPF-7	157.8	2	0.0870%	0.0879%	-0.001%
CESSNA	T-50	78.3	1	0.0431%	0.0440%	-0.001%
GRUMMAN	G-44A	82.8	1	0.0456%	0.0440%	0.002%
RAND ROBINSON/	KR-1	84.9	1	0.0468%	0.0440%	0.003%
DEHAVILLAND	DH-82A	93.8	1	0.0517%	0.0440%	0.008%
SCORPION/HB	133	95.2	1	0.0525%	0.0440%	0.009%
CESSNA	441	96.0	1	0.0529%	0.0440%	0.009%
FAIRCHILD	24W-46	98.9	1	0.0545%	0.0440%	0.011%
CESSNA	425	100.0	1	0.0551%	0.0440%	0.011%
AERO COMDR	500	348.6	4	0.1921%	0.1758%	0.016%
REPUBLIC	RC-3	195.7	2	0.1078%	0.0879%	0.020%
PIPER	17	117.7	1	0.0649%	0.0440%	0.021%
BEECH	58	919.0	11	0.5064%	0.4835%	0.023%
BEECH	D-17S	124.0	1	0.0683%	0.0440%	0.024%
RAND ROBINSON/	KR-2	128.8	1	0.0710%	0.0440%	0.027%
FORNEY/ALON	AIRCOUPE	211.0	2	0.1163%	0.0879%	0.028%
AERONCA	65-TAL	136.7	1	0.0753%	0.0440%	0.031%
LEARJET	24	142.5	1	0.0785%	0.0440%	0.035%
CESSNA	414(A)	387.7	4	0.2137%	0.1758%	0.038%
AERONCA	7DC	149.0	1	0.0821%	0.0440%	0.038%
NAVAL FCTY	N3N	158.7	1	0.0875%	0.0440%	0.044%
RYAN	ST-3KR	160.9	1	0.0887%	0.0440%	0.045%
BELLANCA	17(30A,31A)	727.7	8	0.4010%	0.3516%	0.049%
AERO COMDR	114	253.0	2	0.1394%	0.0879%	0.052%
BEECH	76/77	341.7	3	0.1883%	0.1319%	0.056%
PIPER	11	434.1	4	0.2392%	0.1758%	0.063%
FAIRCHILD	M-62A	202.6	1	0.1116%	0.0440%	0.068%
AERO COMDR	112	463.7	4	0.2555%	0.1758%	0.080%
PIPER	J-4	243.9	1	0.1344%	0.0440%	0.090%
RUTAN/HB	VARI-EZE	245.4	1	0.1352%	0.0440%	0.091%
PIPER	20	487.4	4	0.2686%	0.1758%	0.093%
GLOBE	GC-1B	413.0	3	0.2276%	0.1319%	0.096%
CESSNA	205	258.0	1	0.1422%	0.0440%	0.098%
TAYLORCRAFT	DCO-65	264.3	1	0.1457%	0.0440%	0.102%
BELNCA/CHAMP	7GC	512.7	4	0.2825%	0.1758%	0.107%
PIPER	30	1212.1	12	0.6680%	0.5275%	0.140%
PIPER	J-5	342.3	1	0.1886%	0.0440%	0.145%
LAKE	LA-4	374.2	1	0.2062%	0.0440%	0.162%
PIPER	16	385.2	1	0.2123%	0.0440%	0.168%

Make	Model	Population	Fire Accidents	Population %	Fire %	Difference
PIPER	12	1374.6	13	0.7575%	0.5714%	0.186%
BEECH	200	591.0	3	0.3257%	0.1319%	0.194%
BEECH	33	1511.8	14	0.8331%	0.6154%	0.218%
AERONCA	11AC	741.0	4	0.4083%	0.1758%	0.233%
BELNCA/CHAMP	7ECA	940.3	5	0.5182%	0.2198%	0.298%
BEECH	35	6882.6	79	3.7929%	3.4725%	0.320%
CESSNA	206	2352.5	22	1.2964%	0.9670%	0.329%
CESSNA	120	917.1	4	0.5054%	0.1758%	0.330%
AERONCA	15AC	691.3	1	0.3810%	0.0440%	0.337%
ERCOUPE	415	2068.7	18	1.1400%	0.7912%	0.349%
CESSNA	177	2737.7	26	1.5087%	1.1429%	0.366%
PIPER	38-112	1144.0	4	0.6304%	0.1758%	0.455%
PIPER	24	3329.3	31	1.8347%	1.3626%	0.472%
LUSCOMBE	8A	1203.0	4	0.6629%	0.1758%	0.487%
CESSNA	175	1410.5	6	0.7773%	0.2637%	0.514%
NAVION	A	1313.7	3	0.7240%	0.1319%	0.592%
CESSNA	170	2578.2	17	1.4208%	0.7473%	0.674%
BELLANCA	1419	1539.9	3	0.8486%	0.1319%	0.717%
TAYLORCRAFT	BC12-D	1508.7	2	0.8314%	0.0879%	0.744%
CESSNA	180	2603.3	13	1.4346%	0.5714%	0.863%
AERONCA	7AC	2186.0	7	1.2047%	0.3077%	0.897%
MOONEY	M20	5135.8	43	2.8302%	1.8901%	0.940%
PIPER	J-3	3818.3	24	2.1042%	1.0549%	1.049%
CESSNA	140	2481.6	5	1.3676%	0.2198%	1.148%
PIPER	22	5265.9	38	2.9019%	1.6703%	1.232%
PIPER	28	19217.5	199	10.5904%	8.7473%	1.843%
CESSNA	150	17682.6	95	9.7445%	4.1758%	5.569%
CESSNA	172	21288.7	88	11.7318%	3.8681%	7.864%
TOTALS,	THIS GROUP:	181462.3	2275	100.00%	100.00%	
Totals as	% of GA Fleet	78.71%	6.30%			

APPENDIX F. SUMMARY OF AIRCRAFT ACCIDENTS WITH POST-IMPACT FIRES, FATALITIES
GENERAL AVIATION AIRCRAFT WITH FATAL ACCIDENTS, POPULATION >10, 1974-1983

Aircraft make COL. A	Aircraft model Col. B	Average population during period 1974-83 Col. C	Number of Accidents involving post-impact fires Col. D	Number of fatalities in accidents with post-impact fires Col. E	Number of fatal accidents with post-impact fires Col. F	Aircraft's fires as portion of this Group's accidents (D/2036) Col. G	Aircraft's fires as portion of this Group's post-impact fires with fatalities (F/368) Col. H	Difference, Col.G-Col.H Col. I
CESSNA	182	3150	90	27	23	4.4204%	6.2500%	-1.830%
BEECH	18	815	80	31	20	3.9293%	5.4348%	-1.506%
MOONEY	M20	5136	43	26	12	2.1120%	3.2609%	-1.149%
BEECH	36	1165	19	17	7	0.9332%	1.9022%	-0.969%
BEECH	24(23R)	563	14	16	6	0.6876%	1.6304%	-0.943%
BEECH	200	591	3	21	3	0.1473%	0.8152%	-0.668%
PIPER	14	105	3	4	3	0.1473%	0.8152%	-0.668%
PIPER	24	3329	31	15	8	1.5226%	2.1739%	-0.651%
CESSNA	177	2738	26	15	7	1.2770%	1.9022%	-0.625%
GRUM AMER	AA1/AA5	2625	61	27	13	2.9961%	3.5326%	-0.537%
AERO COMDR	680	349	17	14	5	0.8350%	1.3587%	-0.524%
PIPER	31	1435	45	21	10	2.2102%	2.7174%	-0.507%
CESSNA	210	4754	62	28	13	3.0452%	3.5326%	-0.487%
ERCOUPE	415	2069	18	8	5	0.8841%	1.3587%	-0.475%
CESSNA	195	469	7	3	3	0.3438%	0.8152%	-0.471%
CESSNA	340	622	13	8	4	0.6385%	1.0870%	-0.448%
GREAT LAKES	2T-1A	145	3	3	2	0.1473%	0.5435%	-0.396%
MAULE	M-4	231	3	3	2	0.1473%	0.5435%	-0.396%
NAVION	A	1314	3	2	2	0.1473%	0.5435%	-0.396%
PIPER	18	3048	42	12	9	2.0629%	2.4457%	-0.383%
CESSNA	404	165	4	9	2	0.1965%	0.5435%	-0.347%
PIPER	11	434	4	4	2	0.1965%	0.5435%	-0.347%
NORTH AMERICAN	AT-6/SNJ	485	10	5	3	0.4912%	0.8152%	-0.324%
CESSNA	500	246	5	9	2	0.2456%	0.5435%	-0.298%
DEHAVILLAND	DHC-3	23	5	3	2	0.2456%	0.5435%	-0.298%
CESSNA	170	2578	17	6	4	0.8350%	1.0870%	-0.252%

Make	Model	Population	Fire accidents	Fire fatalities	Fatal accidents	Fire ratio	Fatal ratio	Fire-fatal %
BEECH	58P	336	6	5	2	0.2947%	0.5435%	-0.249%
BEECH	D-17S	124	1	2	1	0.0491%	0.2717%	-0.223%
BELL	222	25	1	3	1	0.0491%	0.2717%	-0.223%
BUSHBY/HB	MM-II	59	1	1	1	0.0491%	0.2717%	-0.223%
GRUMMAN	FM-2	18	1	1	1	0.0491%	0.2717%	-0.223%
GULF AMER	980(695)	50	1	2	1	0.0491%	0.2717%	-0.223%
HAWKER SDLY	TMK20	27	1	1	1	0.0491%	0.2717%	-0.223%
NORD STAMPE	SV4C	48	1	1	1	0.0491%	0.2717%	-0.223%
PIPER	J-5	342	1	1	1	0.0491%	0.2717%	-0.223%
RUTAN/HB	VARI-EZE	245	1	1	1	0.0491%	0.2717%	-0.223%
STINSON	JR.S.	19	1	2	1	0.0491%	0.2717%	-0.223%
VAN'S/HB	RV-3	45	1	1	1	0.0491%	0.2717%	-0.223%
CESSNA	185	1201	18	7	4	0.8841%	1.0870%	-0.203%
BEECH	T34	52	7	3	2	0.3438%	0.5435%	-0.200%
PIPER	J-3	3818	24	8	5	1.1788%	1.3587%	-0.180%
PIPER	12	1375	13	4	3	0.6385%	0.8152%	-0.177%
BEDE	BD5B	51	2	1	1	0.0982%	0.2717%	-0.174%
AERONCA	7BCM	210	3	2	1	0.1473%	0.2717%	-0.124%
BEECH	100	155	3	1	1	0.1473%	0.2717%	-0.124%
BEECH	76/77	342	3	1	1	0.1473%	0.2717%	-0.124%
BRANTLY	B-2	52	3	1	1	0.1473%	0.2717%	-0.124%
STARDUSTER/HB	SA-100	41	3	1	1	0.1473%	0.2717%	-0.124%
STEEN/HB	SKYBOLT	132	3	1	1	0.1473%	0.2717%	-0.124%
MITSUBISHI	MU2	410	15	15	3	0.7367%	0.8152%	-0.078%
AERO COMDR	500	349	4	1	1	0.1965%	0.2717%	-0.075%
BELNCA/CHAMP	7GC	513	4	1	1	0.1965%	0.2717%	-0.075%
CESSNA	414(A)	388	4	8	1	0.1965%	0.2717%	-0.075%
CESSNA	L-19	22	4	1	1	0.1965%	0.2717%	-0.075%
MAULE	M-5	167	4	2	1	0.1965%	0.2717%	-0.075%
PIPER	38-112	1144	4	2	1	0.1965%	0.2717%	-0.075%
CESSNA	421	1028	27	22	5	1.3261%	1.3587%	-0.033%
AERO COMDR	690	39	5	2	1	0.2456%	0.2717%	-0.026%
BEECH	50	346	5	2	1	0.2456%	0.2717%	-0.026%
HILLER	FH1100	71	5	5	1	0.2456%	0.2717%	-0.026%

Make	Model	Population	Fire accidents	Fire fatalities	Fatal accidents	Fire ratio	Fatal ratio	Fire-fatal %
STARDUSTER/HB	SA-300	179	5	1	1	0.2456%	0.2717%	-0.026%
BEECH	58	919	11	3	2	0.5403%	0.5435%	-0.003%
BELNCA/CHAMP	7KCAB	327	11	2	2	0.5403%	0.5435%	-0.003%
CESSNA	411	177	17	8	3	0.8350%	0.8152%	0.020%
BELLANCA	1413	246	6	3	1	0.2947%	0.2717%	0.023%
PIPER	31T	330	6	8	1	0.2947%	0.2717%	0.023%
AEROSTAR	601P	364	12	7	2	0.5894%	0.5435%	0.046%
CESSNA	401	250	12	3	2	0.5894%	0.5435%	0.046%
PIPER	23	3421	73	25	13	3.5855%	3.5326%	0.053%
AERO COMDR	560	171	7	1	1	0.3438%	0.2717%	0.072%
AERONCA	7AC	2186	7	1	1	0.3438%	0.2717%	0.072%
BEECH	19	249	7	4	1	0.3438%	0.2717%	0.072%
BELLANCA	17(30,31)	201	7	3	1	0.3438%	0.2717%	0.072%
DEHAVILLAND	DHC-2	255	7	4	1	0.3438%	0.2717%	0.072%
BEECH	90	956	13	14	2	0.6385%	0.5435%	0.095%
CESSNA	337	1220	19	3	3	0.9332%	0.8152%	0.118%
BELLANCA	17(30A,31A)	728	8	3	1	0.3929%	0.2717%	0.121%
PITTS	S-1	627	8	1	1	0.3929%	0.2717%	0.121%
THORP/HB	T-18	177	8	2	1	0.3929%	0.2717%	0.121%
BEECH	33	1512	14	4	2	0.6876%	0.5435%	0.144%
CESSNA	320	354	14	3	2	0.6876%	0.5435%	0.144%
ENSTROM	F-28	215	9	2	1	0.4420%	0.2717%	0.170%
BELNCA/CHAMP	7GCBC	537	15	4	2	0.7367%	0.5435%	0.193%
BELNCA/CHAMP	8GCBC	216	10	1	1	0.4912%	0.2717%	0.219%
BEECH	65	108	16	3	2	0.7859%	0.5435%	0.242%
HUGHES	269	597	16	2	2	0.7859%	0.5435%	0.242%
CESSNA	172	21289	88	25	15	4.3222%	4.0761%	0.246%
BEECH	60	86	11	1	1	0.5403%	0.2717%	0.269%
HUGHES	369	382	11	1	1	0.5403%	0.2717%	0.269%
BEECH	23	1716	23	6	3	1.1297%	0.8152%	0.314%
CESSNA	207	246	12	1	1	0.5894%	0.2717%	0.318%
PIPER	30	1212	12	6	1	0.5894%	0.2717%	0.318%
CESSNA	414	337	13	2	1	0.6385%	0.2717%	0.367%
BELL	47J	92	14	1	1	0.6876%	0.2717%	0.416%

Make	Model	Population	Fire accidents	Fire fatalities	Fatal accidents	Fire ratio	Fatal ratio	Fire-fatal %
PIPER	22	5266	38	8	5	1.8664%	1.3587%	0.508%
STINSON	108(1-3)	622	16	2	1	0.7859%	0.2717%	0.514%
CESSNA	206	2353	22	8	2	1.0806%	0.5435%	0.537%
PIPER	34	1353	17	5	1	0.8350%	0.2717%	0.563%
BELL	206	258	23	1	1	1.1297%	0.2717%	0.858%
BEECH	55	2246	43	9	4	2.1120%	1.0870%	1.025%
PIPER	32	3270	64	30	7	3.1434%	1.9022%	1.241%
BELL	476	962	55	7	5	2.7014%	1.3587%	1.343%
CESSNA	310	2978	55	8	5	2.7014%	1.3587%	1.343%
CESSNA	150	17683	95	17	10	4.6660%	2.7174%	1.949%
BEECH	35	6883	79	27	4	3.8802%	1.0870%	2.793%
PIPER	28	19218	199	38	24	9.7741%	6.5217%	3.252%
TOTALS,	THIS GROUP:	156794.7	2036	767	368	100.000%	100.000%	
Totals as	% of GA fleet	68.01%	86.60%	96.12%	NA			
							MEAN =	0.000%
							MEDIAN =	-0.075%
							pop STDEV =	0.660%
							pop var=	0.004%

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